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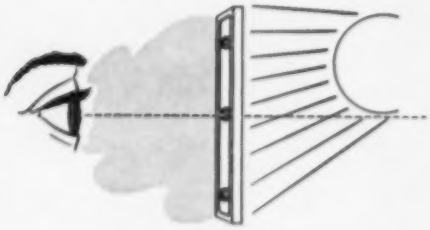

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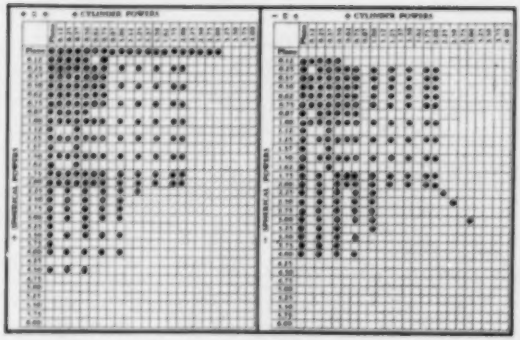

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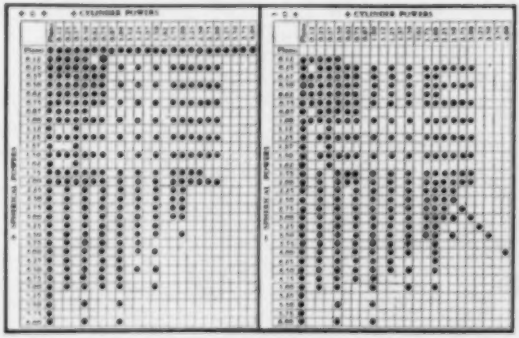

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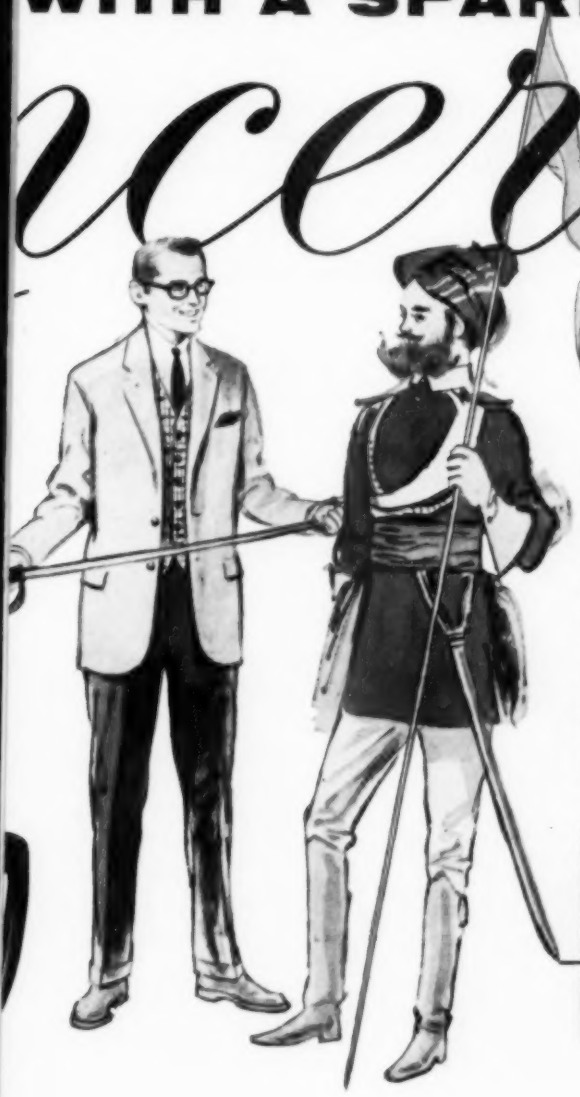

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THE OPTOMETRIST AND PSYCHOLOGICAL FACTORS IN VISUAL WORK*

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The title of this paper is broad and ambiguous. Let me try to indicate at the outset the major problem I want to discuss. Optometrists, like everyone else, work with people, and like other health practitioners, work with people who have problems of one sort or another. It would simplify things considerably if the optometrist could manage in some way to identify and isolate purely ocular visual problems, and work with these in independence of other factors in the adjustment of the individual. However, it is being increasingly recognized that health problems are seldom simple and unitary. Factors which are variously described as psychological, emotional, and motivational; or related to the adjustment, or to the personality of the patient, play a part in many aspects of many health problems. I want to try to outline the aspects of optometric practice where there may be some influence of psychological factors. The implications of this presentation will largely be left to the individual reader. As will be seen, I am not discussing a matter which is new to optometrists. Many of the sources of information come from optometrists and the optometric literature.

WHERE DO PSYCHOLOGICAL FACTORS ENTER OPTOMETRIC PRACTICE

Optometrists are fortunate because many, perhaps a great majority, of the problems they handle are relatively free from psychological influences. There seems to be no evidence that refractive errors or oculomotor anomalies, as such, are induced or modified by motivational, emotional, and personality variables. On the other hand, optometrists are aware that there are many aspects of optometric practice which may be defined broadly as psychological in nature. For example, the rapport between patient and practitioner is clearly of importance, both for the comple-

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tion of a successful examination, and for the future. Much has been written on the subject of "patient management." In my opinion, this psychological aspect of optometric practice can best be handled as a by-product of the able and sincere conduct of the other facets of practice, rather than as a primary goal in itself.

Optometrists recognize that there are great individual differences in the ability of patients to adapt to new prescriptions. Similarly there are great differences in the way patients will tolerate the limitations imposed by wearing any given prescription, and in the way they adapt to or tolerate refractive errors and motor anomalies prior to correction. There may be some question as to how much these individual differences should be regarded as "psychological," but at least they are factors of which the optometrist must be aware over and beyond the basic ocular condition.

Undoubtedly all optometrists have examined patients whose reported visual symptoms and complaints were not consonant with the examination findings—usually in such cases there being many more complaints, symptoms, problems, and limitations of visual capacity than seem warranted by the actual visual condition. Optometrists are probably all familiar with the satisfactory (perhaps temporary) beneficial effect of insignificant changes or adjustments. It seems fair to say that in many cases the visual symptomatology, particularly in the realm of self-assessment of visual capacity, and report of feelings of discomfort, is influenced by non-ocular factors, many of which may be classified as psychological in nature.

There is another broad area of optometric interest and responsibility where individual differences in response play a significant part, namely, the area of orthoptics and visual training. I am sure that many optometrists have been quite surprised at times at the effectiveness of a few sessions on some training device in producing reports of alleviation of some symptom, improvement of functional efficiency on the job, relief of some "reading difficulty," or achievement of adaptation to some visual handicap. The claim is not made here that *all* visual training achieves its benefits through the general therapeutic effect of "doing something" for the patient. But it is proposed that in some instances the "general therapeutic effects" are predominant, and the specific visual effects minimal or non-existent. At least we can find examples of this in other fields, where the beneficial effects on vision of all sorts of nonsensical procedures have been warmly attested.

Much of the work in the area of visual training has been limited in its interpretation because no control groups have been used. This has

made it impossible to determine how much of the measured or reported effect of a visual training procedure can be attributed to the specific procedure, and how much to the fact that some (any) procedure in which the patient believed was used, with a resultant alleviation of anxiety, increase in motivation, and better adaptation to the task or job, resulting in some measured or reported improvement.

Even with the use of control groups, there would remain the problem of differential enthusiasm (of the person administering the training) for the supposedly effective procedure on the one hand and for the control procedure on the other. Many scientific experiments involving human response have given successful results for an enthusiastic proponent of a method or procedure, but negative results for someone who was negative or dispassionate.

Optometrists certainly should take advantage of the beneficial influence of their personal enthusiasm and of their sincere desires to be helpful. They should appreciate the importance of their having warm and positive attitudes toward their patients' problems, and of instilling confidence, particularly where they are trying to achieve training which relates to the *use* of vision in performance, and where level of performance can be influenced by the motivation and attitudes of the trainee. In so doing, however, they are working in the realm of psychological factors.

Finally, in this catalogue of psychological factors in optometric practice, it can be pointed out that the optometrist may be faced with patient problems which are clearly non-visual, but instead are related to general adjustment. These may range all the way from requests for vocational advice, through only slightly disguised requests for counseling on family matters, to the occasional contacts with seriously disturbed people.

These are some of the aspects of optometric practice which I term psychological. It may be that these are simply the basic elements of human relationships which everyone recognizes as entering into any interplay between human beings. The question still remains as to what part these relationships play in various aspects of practice, and the extent to which the optometrist should be aware of and concern himself with them. How far should the optometrist go in systematizing, understanding and making use of psychological factors in his work. In the remainder of this presentation I will try to point out and summarize some of the available information and opinion on these questions which are available both in the optometric and psychological literature.

PROFESSIONAL AND "EVERYDAY" PSYCHOLOGY

Before proceeding, it might be well to emphasize a distinction between psychology narrowly defined in terms of what professional psychologists know and do, and psychology logically defined as the whys and wherefores of human behavior, particularly in relation to other individuals and groups. This latter broad field is the concern of everyone, and while professional psychologists are working to develop scientific procedures, measurement techniques and specialized experience in understanding and modifying human behavior, everyone else (including psychologists during their off-duty hours) will have to formulate his own system for getting along with others and solving the "human relations" problems with which he is faced. Thus the optometrist can accept some responsibility for understanding and dealing with psychological problems in the broad sense, without feeling that he is entering into someone else's field, and without feeling that he must drop everything else and become a research psychologist.

THE FIELD OF PSYCHOLOGY

It would be helpful at this point to enter into a detailed description of the professional field of psychology. This would give a picture of this related activity and help in an evaluation of what help and information optometrists can expect to get from this source. Briefly, there are over 10,000 members of the American Psychological Association, in 17 divisions. There are many more psychologists who are not members of this organization, and many professional people in closely related fields. They have a tremendous diversity of interests, and are filling the eleven journals of the APA, and the greater number not published by this organization, with research reports. Finally, they are beginning to struggle with the problem of legal status. (I do not think the somewhat negative view expressed by the editor of this Journal[6] toward these efforts is warranted.)

PSYCHOLOGICAL FACTORS IN VISUAL SYMPTOMATOLOGY

There are two kinds of information optometrists might hope to gain from psychologists: one, additional general understanding of human behavior, and two, specific studies of the influence of learning, personality, emotional factors, and motivation on visual performance, particularly of the sort listed, these being the aspects of visual performance of primary concern to the optometrist. In regard to the first, it can be pointed out that some additional general understanding can be achieved by careful study in the field of psychology. However, it is also easy to oversimplify, and to accept partial and pseudo explanations. Books on "popular psychology" are likely either to prove disappointing

or misleading when one attempts to apply the general information contained to specific human relations problems. So it is difficult to suggest how much value optometrists would find in undertaking a rather formal study of general principles of psychology.

I think there is more of interest and value in the available reports on psychological factors in visual preformance. However, as indicated previously much of the information comes from optometrists and the optometric literature.

There has been considerable recognition of the importance of psychological factors in visual symptomatology. Bannon[4] has reviewed this problem in a previous Academy presentation. He classifies symptoms as visual, ocular, and referred, and points out that some symptoms, particularly those classed as referred (e.g., gastro-intestinal upset, headaches, and general fatigue *presumably* related to the use of the eyes) and some generalized ocular discomfort and so-called eye-strain may *not* be associated with ocular conditions.

His paper warrants careful rereading in the present context. I would like to make one extension of the views presented. Bannon points out the necessity of a follow-up in the case of referred symptoms, to make sure that the visual correction has been effective, the assumption being that if the referred symptoms are relieved, then they must have had an ocular origin. Unfortunately, this assumption is not warranted in all cases, because general symptoms can be relieved (perhaps only temporarily) through the suggestive effects of whatever procedure the optometrist uses.

Wick[10] has discussed special psychological problems in handling older patients. Emphasis is placed on the necessity for good human relations practices, particularly where special conditions develop such as subnormal vision and cataracts. He also points out the need for preparing older patients for such difficulties. Optometrists could also render a real service to not-so-old patients by educating them concerning the nature of imminent presbyopia. Of course, individuals who have not had previous need for optometric service cannot be educated in advance in this way, and optometrists should continue the developments they have started in contributing to public education, with awareness of the importance of attitudes toward and understanding of visual problems and their treatment.

The special problems of patient acceptance of trifocal lenses have been discussed by Bannon.[3] After presenting the need for patient indoctrination to overcome antipathy, the need for avoidance of certain terminology, and the need for treating each patient individually, he con-

cludes that it is necessary to be as much a psychologist as a refractionist to prescribe these lenses.

The problem of trying to analyze the influence of psychological factors in production of symptoms and in response to treatment has been faced by workers in the field of aniseikonia, although many of the same considerations apply to all areas of optometric practice.

Lancaster[7] has referred to the indirect effect of treatment procedures, which have been termed psychological in this paper, as "psychotherapy." Without going into the difficult problem of the precise meaning of terms in this area, it can be pointed out that this author freely admitted that indirect effects occur in all health practices, and he stated that practitioners are derelict in their duty if they do not capitalize on these effects.

Lancaster suggested that at least a partial separation between direct and indirect effects of applying a correction for aniseikonia can be based on the speed with which the effects take place. If a patient reports complete relief of troublesome symptoms almost immediately after putting on a new eikonic correction, the result should not be attributed to the optical effect of the lenses. It is more likely that these immediate results should instead be accounted for in such terms as "relief of axiety," "improved confidence," "change of attitude," etc.

Probably this same "speed of cure" criterion would be useful for distinguishing predominantly psychological effects from more direct visual effects in some other areas of optometric practice, but not in all. The important point, however, is that optometrists should be aware at all times of the possibility that the beneficial effects of their procedures may accrue, in greater or lesser extent, depending on circumstances, through indirect mechanisms. As pointed out above, Lancaster[7] has emphasized the necessity and even the obligation of practitioners to take advantage of indirect effects, but he also went on to say, essentially, that this aspect of treatment should be frankly recognized, and taken into account when scientifically evaluating different methods.

It has been thought that the obviously special examination procedures used, and the great amount of individual attention accorded the patient, in examining for aniseikonia, and perhaps the special competence and prestige of practitioners in this field, might attract a higher percentage of patients with psychological problems and at the same time produce a higher percentage of "psychological cures." Although comparable data are not available from regular practices, Bannon and Textor[11] found only 9 per cent of a group of successful eikonic patients whose symptoms were suspected of having non-ocular origin. On the

other hand, almost half of a group of unsuccessful eikonic patients were classified as having symptoms which were "not commensurate" with the ocular findings. So it is apparent at least that this form of specialized treatment does not produce relief of symptoms in all patients where many of the symptoms are suspected of being non-ocular in origin.

More research is needed, particularly using control group techniques, and satisfactory samples of practitioners, including enthusiasts, negativists, and scientific dispassionates (sometimes referred to as "cold fish"), in order to further determine the relative importance of ocular and personality variables in the production of visual symptomatology, particularly ocular and referred symptoms, and in the response and adaptation of individuals to specific visual conditions and remedial procedures. The prestige, confidence, dominance, and "chair-side manner" of the individual practitioner are also of great importance, and could be subjected to scientific investigation, although only with difficulty and rather involved experimental design.

Unfortunately, statistics do not help the individual optometrist much in improving his own performance in gaining rapport and acceptance, or in judging when he is overexerting his authority to convince a patient that the prescribed lenses or training will alleviate symptoms. Undoubtedly Bannon's plea[4] for more careful analysis of symptoms would be helpful. Perhaps all optometrists should experience (artificially induced) refractive errors and should try wearing bifocals and trifocals and even oblique cylinders, in order to experience at first hand some of the distortions of space perception, limitations on the field of view, jump effects, movement in the field due to induced prism, etc., so they would have a better appreciation of symptoms and complaints. It is unfortunate that it is impossible or at least impractical, to induce experimental anxiety states and other conditions of maladjustment, with a strong visual content, so that it would be possible to get a better first hand appreciation of how things work in this realm.

Many at this point may feel that the psychological element is being overemphasized so far as everyday optometry is concerned. If a youngster can't see the board in school because of simple myopia, he is given the indicated correction. He may have some trouble in adapting to the frames, in setting up new habits of keeping his lenses clean, in avoiding certain types of activities, like wrestling and basketball, while wearing his glasses, and at first he may complain that the world moves unexpectedly, but a fairly short time takes care of these problems.

I would agree in general, although I still remember the emotional occasion on which I first had my eyes examined. I knew that I couldn't

see things as well at a distance as my classmates, although everything looked all right. But it was pretty upsetting to have something "wrong" with my eyes. I also knew that the refractionist could look into the patient's eyes and read the secrets of the person's past—I had even seen this done in a recent motion picture! Consequently, having perhaps more than the usual number of guilt feelings of the average twelve year old I felt pretty insecure, to put it mildly. The refractionist "looked into my eyes" with the help of a large and impressive instrument with peculiar geometric designs on it. In a voice which sounded to me at the time as a poor attempt to be non-committal in the face of obvious immanent collapse of my whole visual and personal system, he said "against the rule," and I almost fell out of the chair. I knew I had been against the rule in many ways, including one in particular, but I had hoped, up to that moment, that he might not spot my shortcomings. It wasn't until many years later that I found out what an ophthalmometer is, and that my corneal astigmatism differs from the usual.

As a result of my own experience, I have made it a point to tell my myopic sons that their problem is simply that their eyes are "too strong," which is literally true, so far as the dioptric mechanism is concerned, in the hope of relieving some of the anxieties which they might experience at having "something wrong with their eyes."

This personal account has been presented in only a slightly exaggerated form not because the reader may find some humor in it, but because I am sure that many of us come in time to be insensitive to the insecurities, anxieties, lack of understanding, and even superstitions which many people develop relative to the use of their eyes and the need for eye-care. So even in apparently simple and uncomplicated cases the optometrist should continue his sensitivity to and insight into the patient's view of his problems.

PSYCHOLOGICAL FACTORS IN VISUAL TRAINING

Many studies have emphasized the predominance of emotional problems in "visual non-achievers."

The corollary is that many of the effects of visual training will result from readjustment and resolution of these conflicts and maladjustments. Perhaps a reading of the summary in Anderson and Dearborn[2] on emotional versus specific ocular factors in reading disability (pages 17-22) would serve to emphasize the points I have in mind. This summary indicates the high incidence of adjustment problems among retarded readers, including defensive behavior, aggressive reactions, recessive and withdrawal behavior, self-consciousness, and many others.

There is also a high incidence of parental maladjustment in these

cases, both to the specific non-achievement, and to the family and child situation in general. Parents are reported as being discouraged, baffled, and resentful, and as feeling disgraced. They regarded their children as stupid and foolish, even though the children were normal.

It may be argued that the adjustment problems are secondary, and develop only after the establishment of inadequate performance (which in turn may or may not be dependent on a specific ocular or oculomotor anomaly). Undoubtedly the poor visual performance comes first in some instances, but not in a majority of cases. Evidence seems to indicate that more frequently the reading difficulty or other non-achievement problem is a manifestation of a broader pattern of maladjustment.

Actually, such factors interact with each other, so it is not important whether specific visual non-achievement or general maladjustment develops first. Once established, they tend to perpetuate, amplify and aggravate each other.

It seems to me that the optometrist has a choice in the remedial and visual training program he undertakes in this area. He can limit his interest to those patients who exhibit some specific ocular or oculomotor anomaly, or he can broaden his activities to include perceptual training and remedial reading procedures. In either case he should be aware of the part emotional and adjustment problems play in the development and alleviation of the conditions under consideration.

It should be of interest that many educational psychologists are of the opinion that treatment of reading disability patients with emotional involvement is more effective when emphasis is placed on remediation of the adjustment problems, rather than on the reading problem. In many instances, specific remedial training procedures unless carefully managed will simply serve to emphasize and re-emphasize to the child the inadequate performance around which his problems are currently centered.

General remedial procedures are designed to increase self-confidence, improve performance in social situations, permit self-expression, solve parent-child relationship problems, provide education for the parents as to the part they must play, and stimulate interest in subject matter which naturally makes use of various verbal habits, including reading.

I am not trying to argue that all optometrists who undertake any visual training procedures beyond those designed to remedy specific ocular and oculomotor disabilities should become clinical and educational psychologists. I do think in many instances there is need for increased recognition of the part psychological mechanisms may play in the production of visual non-achievement and in the response to visual train-

ing procedures. This problem has been recognized officially by optometry,[1] although there remain many problems of fact, of terminology, and of emphasis to be worked out.

Those optometrists who are interested in the broad field of visual training and who have not already read the available material in the optometric and psychological literature should certainly do so, in spite of the recognized semantic and scientific problems, which may often leave one more confused than informed. Observation of procedures in child guidance clinics, nursery schools, and psycho-educational clinics, and discussions with the personnel, might help the individual optometrist to decide just where his interests lie, how he can make his best contribution, and how best cooperate with other agencies. At the same time he might learn something additional about techniques for working with children.

INDUSTRIAL AND OCCUPATIONAL VISION PROGRAMS

Much of what has been said above can be reiterated in the context of optometric activities designed to improve industrial performance and job adaptation. The optometrist should recognize that the acceptance of such programs depends on development of positive attitudes among management, supervision and employees. At the same time, the optometrist should exercise great caution in promising overall improvements in production, reduction of accidents, etc. There are so many factors which together determine the characteristics of industrial performance that improvements in vision and lighting may not produce any noticeable effect, and such effects as do occur may be indirectly mediated, through changes in attitude toward the work.[8]

On the other hand, there can be little argument against workers having the best possible visual working conditions, including special occupational corrections where needed, adequate protection and optimum level and type of illumination.

THE OPTOMETRIST'S PART IN COUNSELING

A typical response of college students who have had one or a few courses in psychology is to seek out the adjustment problems of their friends, so they can apply their recently acquired extensive understanding of how such problems develop and how they may be remedied.

With more knowledge often comes more wisdom — a great many psychologists who are not in the clinical field completely avoid counseling on personal problems. Cinical psychologists will undertake such counseling only under satisfactory conditions, one of which is the opportunity to spend a considerable amount of time over a considerable period of weeks or months. Part of the reason is that it takes time to understand

the basic nature of the problem. In addition, a brief verbal account to the patient of the nature of his problem, no matter how insightful that account may be, may have no beneficial effect and may do just the opposite. Time is required to modify habits of thinking, basic attitudes, and overt behavior patterns. Consequently, optometrists may do well to avoid, wherever possible, entering into counseling relationships, and giving advice on personal problems. In many instances, however, it will be necessary to listen to accounts of worries, anxieties, and personal inadequacies, in exploring visual problems. In many cases the borderline between visual problems and general personal problems will be indistinct. In such instances the optometrist might learn to be a successful listener. Perhaps some of the ideas and techniques of "nondirective counseling"[9] would be of interest in this connection.

CONCLUSION

Part of the reason it is difficult to discuss "psychological factors in optometric work" in terms that will be meaningful and acceptable to all concerned is that in the last analysis the separation between the two fields is artificial. However, there is a reasonably clear-cut field of traditional optometry within which many optometrists will prefer to operate. Within this field they can handle the psychological problems by able, sincere, and enthusiastic conduct of their practices. This implies some degree of sensitivity to the extent to which people focalize their worries and anxieties in the visual realm.

If optometrists are interested in perceptual and visual training, and occupational performance, particularly where this involves emphasis on complex tasks such as reading, or on accomplishment of specific industrial jobs, then they should familiarize themselves with the influence of non-visual factors, such as learning, motivation and attitudes. Such information is available from both optometric and psychological sources. Exchange of information with other workers in closely related fields, such as industrial, child, school and educational psychologists, and nursery school and child guidance clinic personnel is also recommended. Optometrists should avoid professional jealousies and isolationism which seem to grow up so readily on both sides of the artificial dividing lines between related professional fields, and which often bar effective communication.

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BOOK REVIEW

TEXTBOOK OF ORTHOPTICS. H. W. Gibson, F.B.O.A., F.S.M.C., D'Orth. Published by Hatton Press Ltd., London, England. 499 pages, 173 illustrations. Cloth. 1955.

Gibson is senior staff orthoptist at the London Refraction Hospital. He has had more than 20 years experience in private practice, clinical and the teaching phases of orthoptics. His first book, Clinical Orthoptics, was excellent, and this, his second book, is broader in scope and better than the first. His style of writing is direct, and easily comprehendible. He covers investigation and diagnosis, as well as office and home training. There are also 15 case histories which illustrate various types of home and office treatment for both phoria and tropic conditions.

The difficulty of transferring techniques from English instruments to their American counterparts is kept to a minimum by presenting both descriptions and pictures of the instruments in the chapter on orthoptic apparatus.

The book is divided into four parts as follows: Part 1, seven chapters, includes a review of ocular anatomy, physiological optics, refraction and orthoptic apparatus; Part 2, six chapters, includes amblyopia, abnormal correspondence, and the investigation and treatment of strabismus; Part 3, seven chapters, includes the investigation, diagnosis and treatment of heterophoria, binocular instability, convergence insufficiency and prescribing relieving prisms; Part 4, paralytic strabismus, glossary of terms, case histories, bibliography and index.

Any practitioner interested in the practice of orthoptics will find this book a valuable addition to his library.

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THE EFFECT OF ERRORS OF REFRACTION ON VISUAL ACUITY*

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INTRODUCTION

The immediate purpose of this investigation has been to establish an accurate basis for the interpretation of visual acuity measurements made with a "test chart" consisting of Landolt rings with their breaks in various directions. Attention has been paid particularly to measurements of acuity as affected by uncorrected errors of refraction.

APPARATUS

The apparatus consisted of a mechanism which revealed one ring at a time of any predetermined size on a large square chart subtending 5° 38′ along each side, viewed at a distance of 18 feet and having a uniform luminance of 80 footlamberts. Results obtained at lower levels of luminance will be presented in subsequent reports. Each ring remained visible for seven seconds, after which the chart was clear for three seconds, during which time the ring was mechanically exchanged for a new ring, which was then revealed for seven seconds, and so on. Each of the four types of rings (breaks up, down, right, and left) was presented an equal number of times during each fifth of a cycle of the mechanism, but the order of presentation was scrambled to avoid memorization. Not until 120 presentations had been given did the machine return to its original order of presentation.

While we were using Landolt broken rings in four positions, the subject recorded each of his responses by pressing one of four electric push-buttons fixed near his hand: the top one when the ring break was at 12 o'clock, the right one when the break was at 3 o'clock, and so on. These buttons were connected to electric counters in the chart circuit, and they recorded all correct responses. Incorrect responses were ignored by the machine. Figures 1, 2, 3 and 4 illustrate the apparatus.

Rings of various sizes have been used, and the size in each case has

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‡Optometrist, Ph.D., Director, School of Optometry; Co-Director, Institute in Research and Vision; Fellow, American Academy of Optometry.

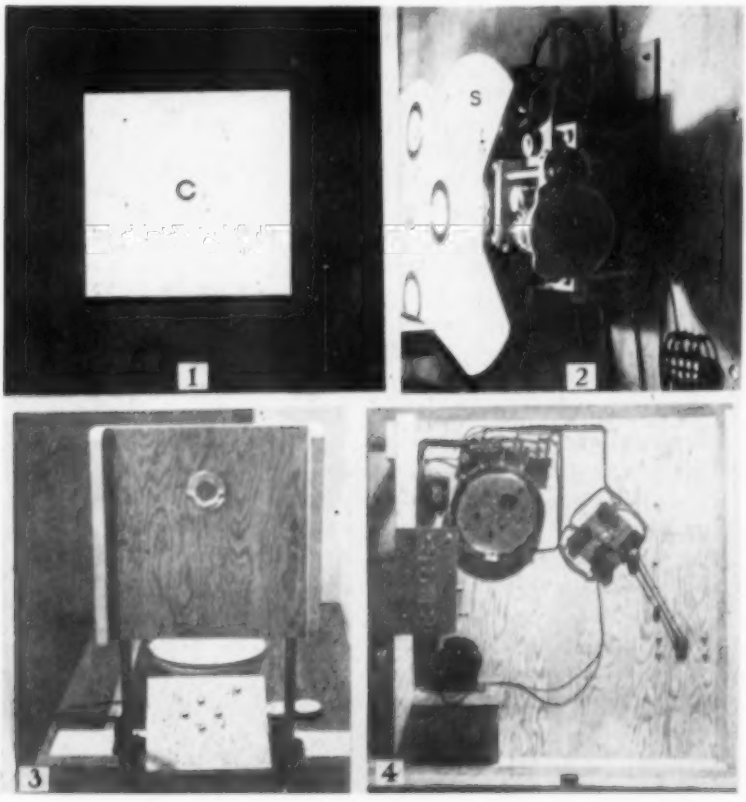


Fig. 1. Appearance of the chart during a presentation of one of the Landolt rings. Rings of various sizes may be presented with breaks up, down, right or left. The ring is actually seen through a hole in the white square, but the edges of the hole are invisible.

Fig. 2. In this illustration, part of the disc which holds four Landolt rings in different positions can be seen. "S" is the shutter which closes over the ring being viewed and remains in this position while the Landolt ring disc rotates to a new position. The white face of the shutter is uniformly bright and as seen through the hole at the center of the white square appears to have the same brightness as the rest of the square.

Fig. 3. The observers' lens and filter holder through which the chart is viewed. Below is the panel of remote control switches with which the observer registers his responses. Correct responses are recorded on the counters shown in Figure 4. At the top right hand corner is a fifth switch for starting the cycles of exposures.

Fig. 4. On the left are the four electrical counters controlled by the remote switches seen in Figure 3. The handle on the side of the counter mounting plate returns all the counters to zero simultaneously. Above and to the right, are the "make" and "break" switches which control the sequence of ring presentations. The large disc has a number of projections which actuate the four switches above it as it turns.

been specified in terms of the distance (in feet) at which the outside diameter subtends five minutes.

SUBJECTS

The only subjects used in the project were those whose visual acuity could be corrected to normal with lenses. Then, various refractive conditions were simulated by adding spheres and cylinders to their distance corrections.

RESULTS OBTAINED WITH SPHERES

In spite of the minor differences recorded with the ring break in the up, down, left, and right positions, it was felt that the subjects were reasonably free from regular and irregular astigmatism, so the result for the four different target positions while using spheres added to the distance correction were averaged and are plotted in Figures 5, 6 and 7. The greatest difference found between the different target positions was that when the break in the Landolt ring was to the right, it was more frequently recognized, and this may be accounted for by the fact that in that position it is identical to the familiar letter "C." At the level at which responding is practically reduced to guessing the subject is apt to call "break to the right" more frequently than other responses, because of his familiarity with the letter "C." Furthermore the subject may habitually fixate to the right of a circle because of the familiarity with the letter "C" in everyday reading. The higher scores obtained with the break to the right will be the subject of a separate report.

ANALYSIS OF THE SPHERE DATA

The curves which have been drawn to represent the data, are integrals of the probability curve, and these have been fitted to the data in the following manner. Each raw score represents the number of times that a Landolt ring of a given size is correctly called. It is assumed that the number called correctly includes the number seen, and a quarter of the remainder, which are called correctly by guessing.

These facts can be expressed in the form of an equation

$$N_c = N_s + 1/4\ (60—N_s). \qquad (1)$$

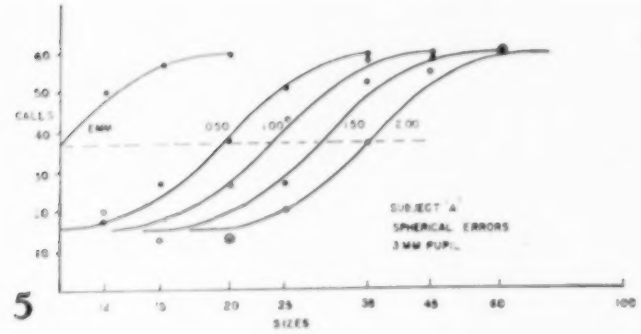
where N_c represents the number called correctly, N_s the number seen, and 60 the total number of exposures in a series. This reduces to the following equation:

$$N_s = (N_c - 15)\ 4/3. \qquad (2)$$

The fraction of times that a ring of a given size will be seen, in other words, the "probability of seeing" is given by the following equation:

$$P = N_s / 60 = 0.0222\ (N_c - 15) \qquad (3)$$

By using this equation, one can transform the raw data from terms



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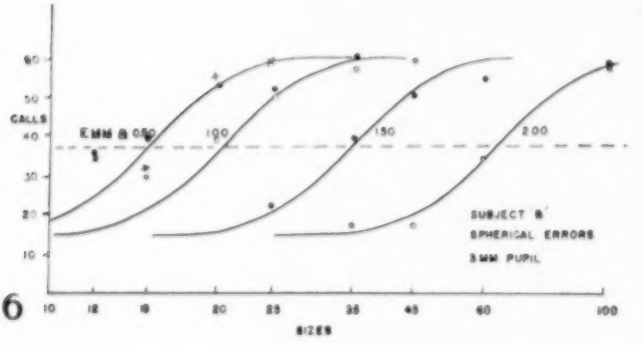

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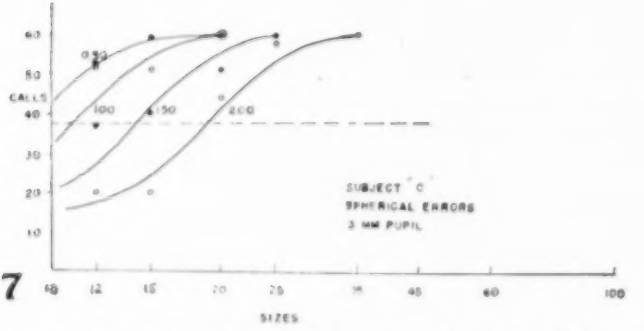

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Fig. 5. The number of times out of 60 that various sizes were called correctly by Subject "A" when he used his distance correction only and then with various plus lenses added to it. The curves used to represent the data have the same shape and are merely displaced laterally. The curves conform to Equation (4).
Fig. 6. Data for Subject "B." Same as Figure 5. A single curve represents both emmetropia and 0.50 D. The points for emmetropia being marked with crosses. The points for 0.50 D. are solid circles.
Fig. 7. Data for Subject "C." Same as Figures 5 and 6.

of "correctly called" to "probability of seeing." Figure 8 shows the data for a single sphere plotted on probability paper. The advantage of using this paper is that the data can be fitted with a straight line, and this can be done by inspection. Having determined the best straight line fit, one can then determine the slope of this line and the point at which it crosses the 50% level of probability. The Abscissa value (S) of this point may be called the 50% level of seeing.

The quantity σ which is inversely proportional to the slope of the line may be defined as the difference between the abscissa values for P = 69.2% and P = 30.9% when these abscissa values are expressed in log units.

The data for each of the spheres for each of the three subjects have been analyzed as illustrated in Figure 8. The σ values have been plotted

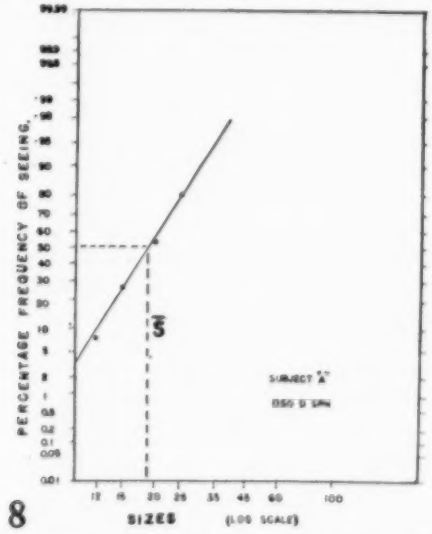

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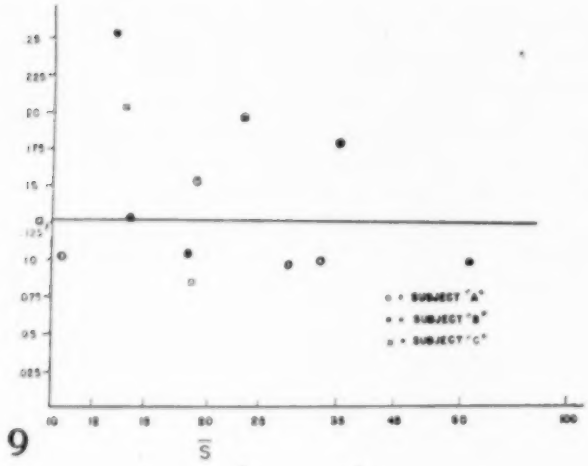
Fig. 8. By using probability paper, the data found for a single sphere may be fitted with a straight line, and in this way the abscissa value $\bar{S}$ of the point of intersection with the 50% level of probability of seeing may be found.

against the S values in Figure 9. It should be noted that σ which is expressed in log units, is relatively independent of $\bar{S}$. There is a logical reason why this should be true. The perception of the position of the break is dependent upon the relationship between the size of the blur circle on the retina and the size of the Landolt ring; and therefore it is not the change in size measured in minutes of arc that is important, but the percentage change in size.



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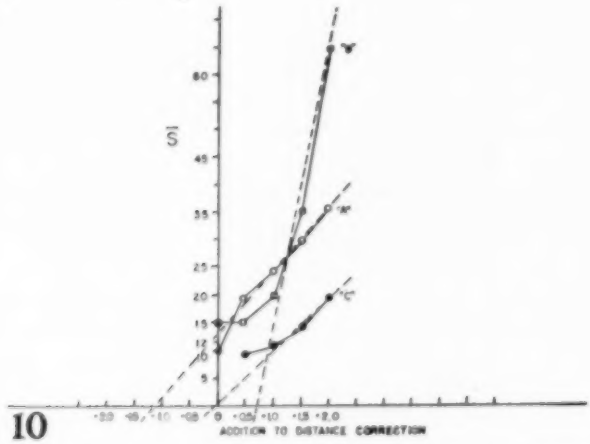

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Fig. 9. In this graph, the data for all three subjects and all sphere powers have been analyzed as illustrated in Figure 8, and the σ values have been plotted against the values of $\bar{S}$. It shows that the average value of σ for the three subjects using the different spheres is 0.1279.

Fig. 10. This graph in which a linear scale is used to indicate the Snellen denominator S, shows the results of using the 50% criterion in evaluating the visual acuity scores of the different subjects for the various degrees of artificial spherical ametropia. The straight dotted curves suggest that subject "B" might accept more plus in his distance correction, and subject "A" more minus.

A straight line on a probability graph as illustrated by Figure 8 can be represented by an ogive curve on the type of graphs in Figures 5, 6 and 7, and the ogive conforms to the following equation

$$N_e = 15 + \frac{45}{\sigma \sqrt{2\pi}} \int_{-\infty}^{x} e^{-\frac{1}{2}(x/\sigma)^2} dx \quad (4)$$

where e is the base of the natural system of logarithms, were $x = \log S - \log \bar{S}$, and where the standard deviation (σ) of the ogive curve is a quantity which is inversely proportional to the slope of the curve at its midpoint.

It will be seen that each curve in Figures 5, 6 and 7 levels off at the $N_e = 15$ reading at its lower end, and at its upper end it levels off at the $N_e = 60$ mark. These two values correspond to the 0% and the 100% level of probability of seeing. So the 50% level of seeing corresponds to an N_e value of 37.5. Each of the curves in Figures 5, 6 and 7 has a σ value of 0.1279 expressed in log units. This is the average of the values of σ in Figure 9.

The curves in Figures 5, 6 and 7 have been fitted to the data by means of a template which conforms to Equation (4). This was moved sidewise to obtain satisfactory fits by inspection for the sets of data corresponding to the various spheres.

$\bar{S}$ represents the value of the abscissa for the point on each curve which falls at the 50% level of seeing. The $\bar{S}$ values for the various curves in Figures 5, 6 and 7 have been determined from these graphs and have been plotted in Figure 10 against the power of the spherical addition to the distance correction.

SELECTION OF RING SIZES

In accumulating data with Landolt rings it is helpful to select ring sizes which represent approximately equal steps on the abscissa scale, and it should be noted that the ring sizes which we have used in this investigation do in fact represent approximately even steps on the logarithmic scale (see Figures 5, 6 and 7). Instead of using exactly uniform steps however, we have varied the steps to permit the use of round numbers.

THE USE OF THE FIFTY PER CENT LEVEL OF SEEING FOR SPECIFYING ACUITY

The abscissa value $\bar{S}$ of the point representing the 50% level of seeing should be selected to represent the denominator of the Snellen fraction for a given subject with a specified lens placed before his eye. As this is the steepest part of the curve, the ring size which yields this frequency of seeing can be most precisely determined.

Using anything but the 50% level of probability of seeing as a criterion of visual acuity leads not only to a lack of precision but also to errors in correlating visual acuity findings with other findings. When, for example, visual acuity is related to myopia, that relationship will

depend on the level of probability of seeing which is used as the criterion for assessing visual acuity.

ASSESSING FRACTIONAL SCORES

In using an ordinary chart containing a finite number of lines, it is necessary to provide some means of assessing visual acuity when the frequency of seeing does not fall exactly at the 50% level for any given line on the chart. It should be noted that the range between the 0% and 100% level of probability of seeing extends over at least three lines on the ordinary visual acuity chart.

It is possible to determine the frequency of seeing for different lines, and to plot and analyze the data as indicated in Figure 8. However, if one can obtain a measure of the frequency of seeing score for a single line, and if this value falls somewhere between the 20% and the 80% levels of seeing, one can determine the size of letter which would yield a frequency of seeing of 50%. It is necessary to assume a certain value of σ for the frequency of seeing curve, and for this purpose an average value such as that determined from the data in Figure 9 can be used. The average value for three subjects using four different spheres is 0.1279. In Equation (4) $\bar{S}$ represents the 50% level of seeing and if we substitute the value of 0.1279 for σ and solve for S, we have an equation for computing S from a given pair of S and N_e values.

An approximate answer can be obtained by using graphs like Figures 5, 6 or 7 and plotting the point corresponding to the given value of N and S. A straight line is drawn through this point having a slope equal to the slope at the midpoint of an ogive with a σ value of 0.1279. One can then determine the abscissa value S of the point on this line at the 50% level of seeing.

Although one can assume a line of a constant slope for various degrees of spherical ametropia, it is no longer constant when astigmatism enters the picture. As will be explained later, information about the slope of the line has to be used in detecting the presence of, and evaluating the amount of astigmatism.

Another approach to the problem is to obtain frequency of seeing data for two different lines which yield values between 20% and 80%, plot the two points on a graph such as that shown in Figure 5, and then draw a straight line connecting these points so that the value of S at the 50% level of seeing can be determined. This procedure is more satisfactory than using a straight line of an assumed slope through a single point.

In the past it has been customary to express visual acuity in terms

of the Snellen fraction for a given line plus the number of letters which can be correctly called on the next line. If one knows the full number of letters on the line, this form of specification of visual acuity can be translated to a simple Snellen fraction by an equation similar to Equation (4) in which the value of a is assumed to be 0.1279.

Better still, one can make out a table for translating ordinary visual acuity scores into the precise Snellen fractions.

EFFECT OF PLUS SPHERES ON VISUAL ACUITY

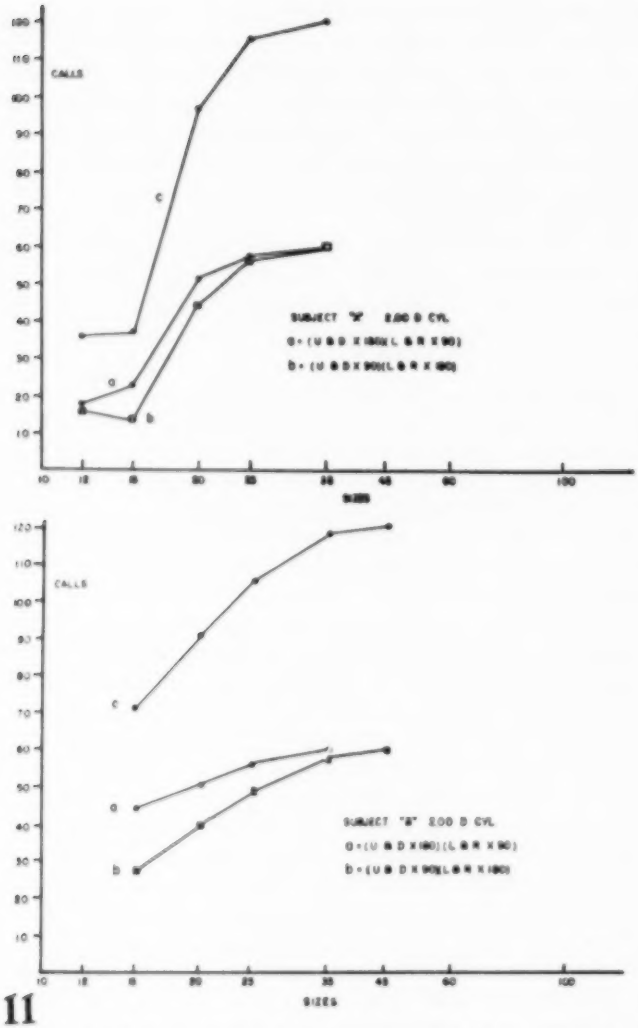
We have used the 50% criterion in evaluating the visual acuity scores of the different subjects for the various degrees of artificial spherical ametropia, and the results are shown in Figure 10. A linear scale is used for the Snellen denomination $\overline{S}$, which is plotted against the degree of spherical ametropia.

This method was adopted on the theory that the denominator of the Snellen fraction should be proportional to the size of the blur circle, and that this in turn should be proportional to the degree of spherical ametropia. This, of course, breaks down as the spherical ametropia approaches zero. But the curve representing the relationship between the denominator of the Snellen fraction and the higher values of spherical ametropia should become tangent to a straight line through the origin of the graph.

The three curves do not approach the ideal relationship, but they do become tangent to straight lines at the higher values of spherical ametropia. The lines do not cross the "X" axis at the zero value of spherical ametropia. This may indicate that the subject used a different amount of accommodation during the measurement of acuity as compared with the measurement of refraction, also the criterion used for determining the refractive error does not necessarily represent the lens which gives maximum acuity. The data in Figure 10 suggests that subject "B" requires for maximum acuity more plus added to his distance correction to the extent of 0.7 diopters, subject "A" needs more minus to the extent of 1.2 diopters, and that subject "C" needs no addition. The apparent need of subject "A" for more minus is probably because of accommodative activity, but the experiment would have to be repeated under cycloplegia to establish the truth of this.

Inasmuch as a subject can accommodate to compensate for minus lenses, it is to be expected that the curves in Figure 10 will level off as the lens added to the distance correction goes from plus to minus.

It should be noticed in Figure 10 that the straight lines which are tangent to the curves at the higher levels of spherical ametropia have different slopes for the different subjects. As 3 mm. artificial


CALLS
c
a
b
SUBJECT "A" 2.00 D CYL
a = (U & D X 180)(L & R X 90)
b = (U & D X 90)(L & R X 180)
SIZES
CALLS
c
a
b
SUBJECT "B" 2.00 D CYL
a = (U & D X 180)(L & R X 90)
b = (U & D X 90)(L & R X 180)
SIZES

11

Fig. 11. Data for Subjects "A" and "B" wearing +2.00 D. cylinders with the axis at 90° or 180°. The abscissa values represent ring sizes. Each ordinate of the "a" and "b" curves represents the number of times out of 60 that the position of the breaks is called correctly and each ordinate of the "c" curves represent the number of correct calls out of 120. The "b" curves represent the combined data for up and down breaks with the axis at 180° and for the right and left breaks with the axis at 90°, i.e., the breaks are 90° away from the axis. The "b" curves represent the

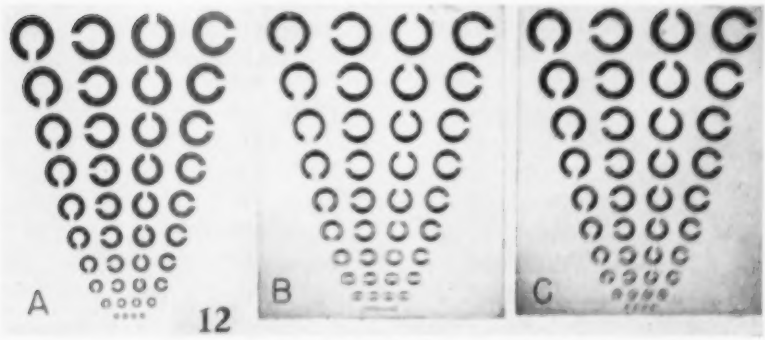


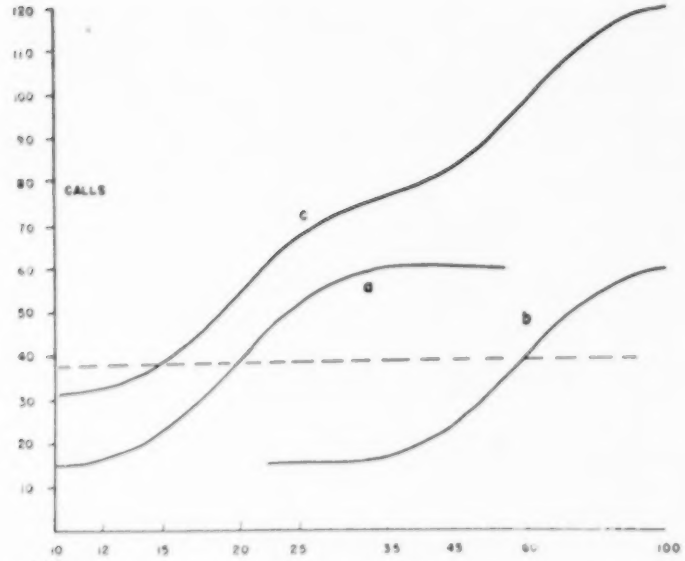
Fig. 12. This is an effort to demonstrate how a +2.00 D. cylinder placed before the emmetropic human eye will affect the appearance of a Landolt ring. "a" shows the effect obtained without the cylinder, "b" when viewed with the cylinder at axis 90°, and "c" with the axis at 45°.

pupils were used, the differences in the slopes cannot be accounted for on this basis, and they probably represent a difference in the capacities of the individuals to interpret the blur of the retinal image. In other words, it is representative of different levels of perception, and as such, identifies a psychological element which must be considered when explaining what is frequently encountered both in the refraction room and in general observation, namely, that individuals with identical ametropia exhibit different levels of recognition.

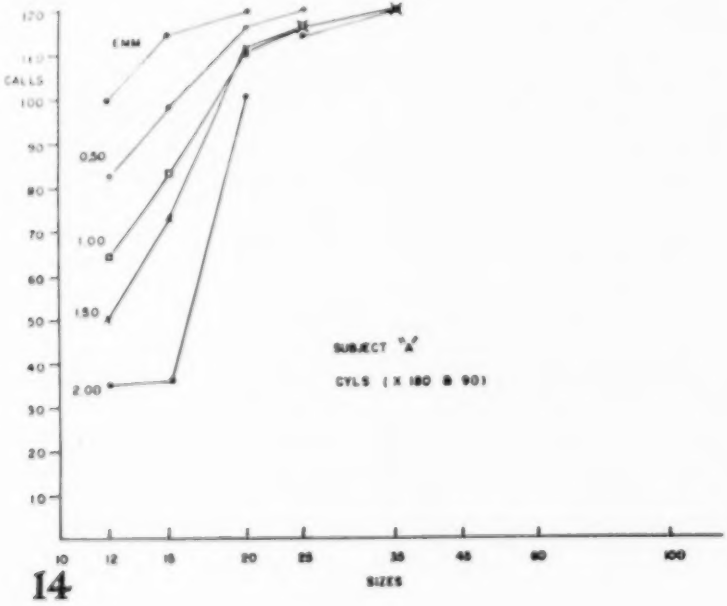
The size of the pupil was kept constant in this investigation so that the effects of the variation in pupil size would be eliminated. But it is obvious that it would be useful to have additional data for pupils of different sizes in order to show the effects of this variable. Since the size of the blur circle on the retina is supposed to vary in direct proportion to the size of the pupil, one might expect to achieve the same effects by throwing the eye out of focus, as would take place when enlarging the pupil.

In order for this to be true, however, the eye would need to be free from spherical aberration, and so it would not be amiss to repeat the experiment using pupils of different sizes. If a mydriatic were used, it would dilate the pupil fully so that several different sizes of artificial pupil could be used. To carry the experiment a logical step further,

combined data for up and down breaks with the axis at 90° and for left and right breaks with the axis at 180°; i.e., the breaks lie in the axis meridian. The "c" curves are the sums of the "a" and "b" curves and represent the combined effects for up, down, right and left breaks for myopic astigmatism either with or against the rule.


CALLS
c
a
b
10 12 15 20 25 35 45 60 100
SIZES

13


EMM
0.50
1.00
1.50
2.00
CALLS
SUBJECT "A"
CYLS (X 180 & 90)
10 12 15 20 25 35 45 60 100
SIZES

14

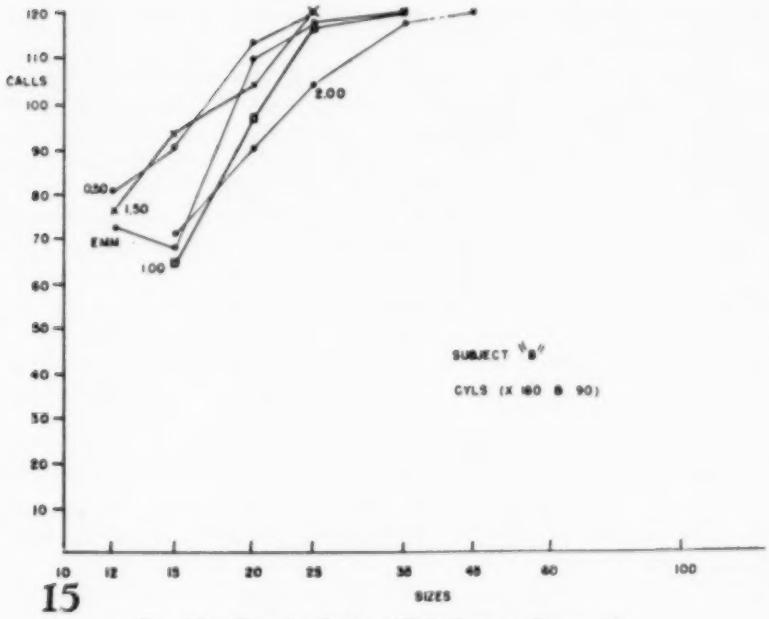


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Fig. 15. Data for Subject "B." Same as Figure 14.

it could be repeated while the subjects were under the influence of a cycloplegic, thus ensuring control of the accommodation as well as the pupil size.

EFFECT OF ASTIGMATISM WITH OR AGAINST THE RULE

To investigate such effects cylinders of various powers were added to the distance corrections of subjects "A" and "B." The cylinder axes were placed first at 90° and then at 180°. The breaks in the ring were up, down, right and left.

The results for a +2.00 cylinder are shown in Figure 11. The data for up and down with the axis at 180° and for right and left with the axis at 90° have been combined and are represented by curve "a." Then the data for up and down with the axis at 90° and for right and left with the axis at 180° have been combined to give curve "b."

Fig. 13. This shows what would happen in Figure 11 if the power of the cylinder were large enough to give considerable lateral displacement between the two component curves, "a" and "b." The combined curve "c" would have two plateaus.
Fig. 14. Data for Subject "A" for a Landolt ring chart with up, down, right and left breaks only. The cylinder axis was at 90° and 180°. Each curve in this graph corresponds to the "c" curve in Figure 11 except that various other cylinder powers have been used.

Each point on each curve represents the number of times out of 60 called correctly.

Figure 12 shows the result of a photographic attempt to demonstrate the effect of a two diopter cylinder on the appearance of a Landolt ring when viewed with the human eye. The camera had a focal length of 135 mm. and an aperture of 27 mm. After it was focussed on the target at 2 meters, a picture was taken (Figure 12A) and then a +0.50 D. cylinder was placed in front of its aperture first with its axis at 180° (Figure 12B) and then with its axis at 45° (Figure 12C). The effect obtained is approximately the same as that with an eye with a +2.00 D. cylinder and a 3 mm. pupil. It will be noted that when the breaks correspond to the axis of the cylinder, they are much less easy to detect than when they lie on the line normal to the axis. This is confirmed in the data in Figure 11 as indicated by the displacement of the curve "a" to the left of the curve "b."

The "c" curves in Figure 11 represent the combined data for up, down, right and left with axis positions at 90° and 180°, the ordinates of the "c" curve in each graph being the sum of the ordinates for curve "a" and curve "b." The slope of this curve ought to be more gradual than of a curve for spherical ametropia, because it represents an average of two ogive curves laterally displaced from each other.

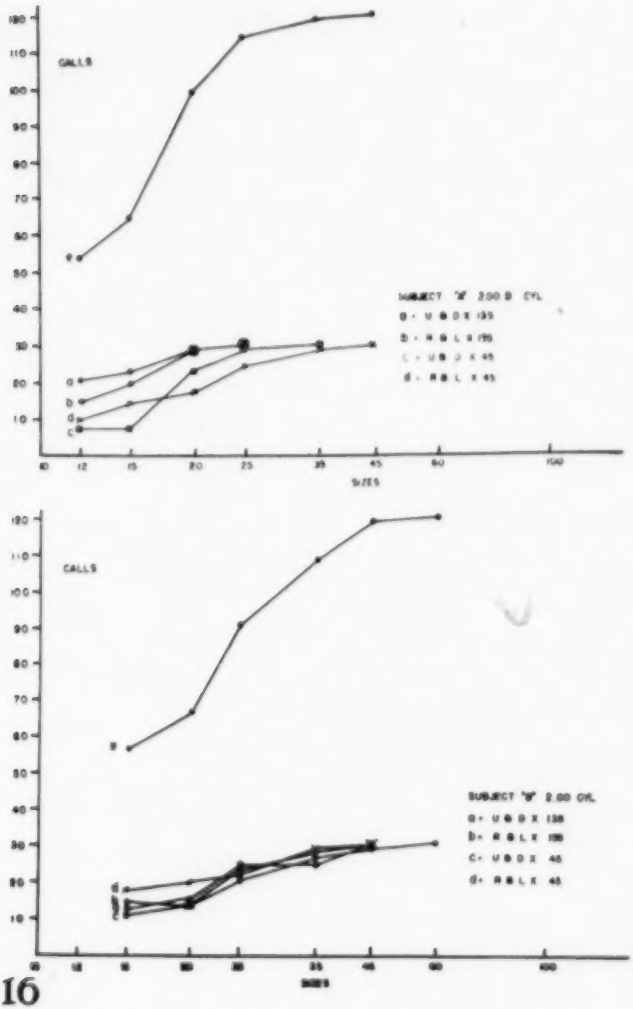
Figure 13 illustrates what would happen with a very strong cylinder. In this case, the two component curves are displaced far enough apart so that the average curve has two plateaus. Although this double plateau curve represents the ultimate stage in the transition from a single plateau curve obtained with a weak cylinder, the early part of the transition should show as a gradual decrease in the slope of the average curve. Theoretically, therefore, one should be able to estimate the amount of astigmatism from the slope of the average curve.

In the case of a double plateau which might show up with higher cylinder powers one can simply connect the point at the 75% level with the point at the 25% level and use the slope of this line to evaluate the amount of astigmatism.

The "c" curves for various cylinder powers for subjects "A" and "B" are shown in Figures 14 and 15. If there is a decrease in the slope of the curves with the increase in cylinder power it is not apparent from the data.

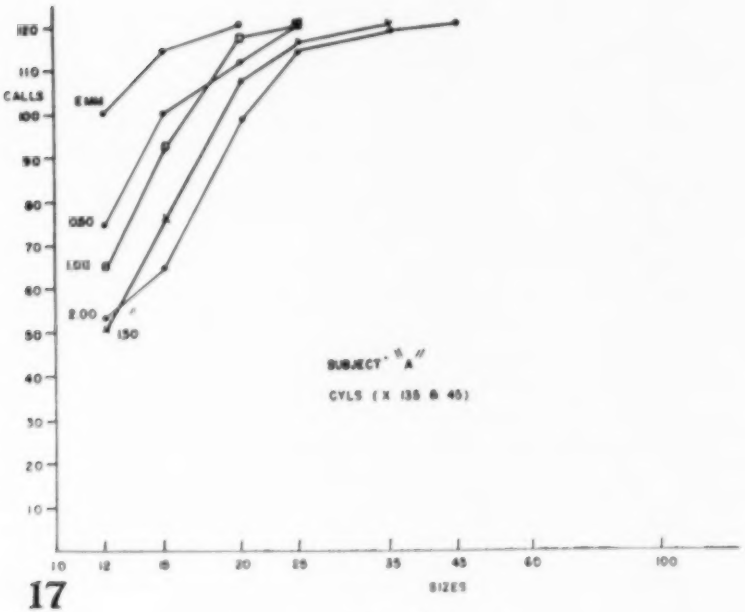
FOUR POSITION CHARTS

What is seen in Figures 14 and 15 corresponds to data which might be obtained with a test chart employing Landolt broken rings

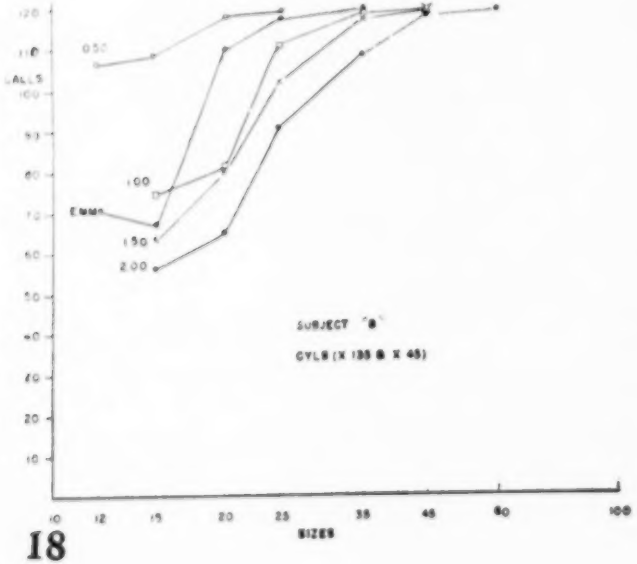


16

Fig. 16. Data for Subjects "A" and "B" wearing +2.00 D. cylinders with the axis at 45° or 135°. In each graph the abscissa values represent ring sizes, and the ordinates of curves "a," "b," "c" and "d" represent correct calls out of 30. In each graph, curve "a" represents the combined up and down data with axis at 135°, curve "b," right and left at 135°, curve "c," up and down at 45° and curve "d," right and left at 45°. Curve "e" is the sum of the other four curves; each ordinate of this curve represents the correct calls out of 60 for breaks at 45° from the cylinder axis.


CALLS
EMM
050
100
2.00
150
SUBJECT "A"
CYLS (X 135 & 45)
SIZES

17


050
100
EMM
150
2.00
SUBJECT "B"
CYLS (X 135 & X 45)
SIZES

18

at four positions, up, down, left, and right in the case of astigmatism with or against the rule. If one could be certain in every case that the astigmatism is either with or against the rule, one could use the data of this type to predict the error of refraction from the measure of acuity. The slope of the curve at its midpoint should give an indication of the amount of astigmatism present, and the displacement of the midpoint of the curve to the right or to the left would indicate the average refractive error for the two principal meridians. Furthermore, one could analyze the data as shown in Figure 11 to determine if the astigmatism is against or with the rule.

The above statement applies only to simple or compound myopic astigmatism with or against the rule. In hyperopic or mixed astigmatism, the subject could focus in either meridian or at the circle of least confusion, and this would make it impossible to interpret the results.

EFFECTS OF OBLIQUE ASTIGMATISM

One of the difficulties with a four position chart is that it cannot be assumed that the astigmatism is always either with or against the rule; it may be oblique. In order to investigate the effect of oblique astigmatism, we repeated the above experiment with the cylinder axes at 45° and 135° instead of at 90° and 180°.

The results for the +2.00 D. cylinder are shown in Figure 16. The "a," "b," "c" and "d" curves represent data for the various positions of the break.

Figure 12C is the result of a photographic attempt to illustrate the effect of a +2.00 cylinder with the axis at 45° upon the appearance of Landolt's rings with breaks up, down, right and left. The effect is the same for all four positions.

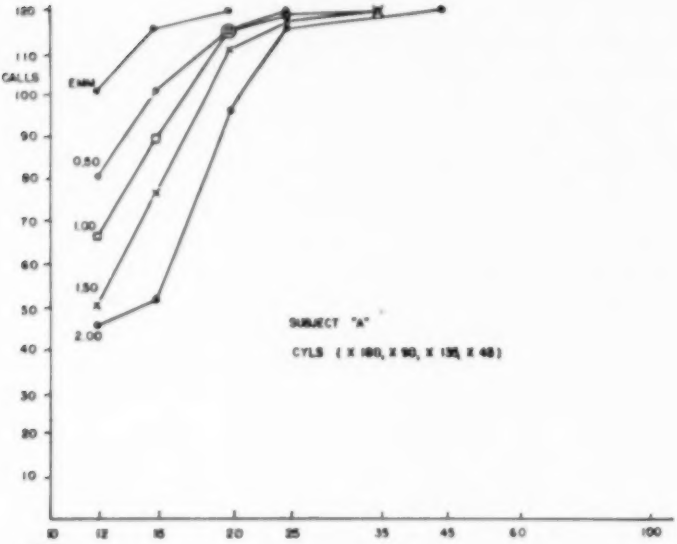
According to this the "a" "b," "c" and "d" curves in each of the graphs in Figure 16 should all coincide, because there should be no difference between having the breaks up and down as opposed to right and left and there should be no difference between having the cylinder axis at 45° as compared with having it at 135°.

Obviously the "a," "b," "c" and "d" curves in the graphs in Figure 16 do not coincide with this discrepancy with what is expected has not been accounted for. It is worse for subject "A" than for subject "B."

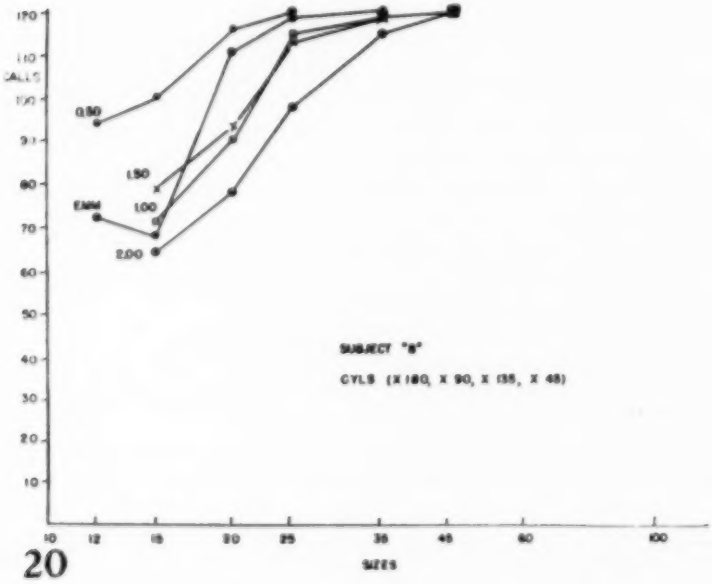
The "e" curve in each graph in Figure 16 represents the data for the "a," "b," "c" and "d" curves pooled together.

Fig. 17. Data for Subject "A" for Landolt rings with up, down, right and left breaks and cylinder axis at 45° and 135°. Each curve in this graph corresponds to the "e" curve in Figure 16 except that various other cylinder powers have been used.

Fig. 18. Data for Subject "B." Same as Figure 15.


CALLS
EMM
0.50
1.00
1.50
2.00
SUBJECT "A"
CYLS (X 180, X 90, X 135, X 45)
SIZES

19


0.50
1.50
EMM
1.00
2.00
SUBJECT "B"
CYLS (X 180, X 90, X 135, X 45)
SIZES

20

EIGHT POSITION CHARTS

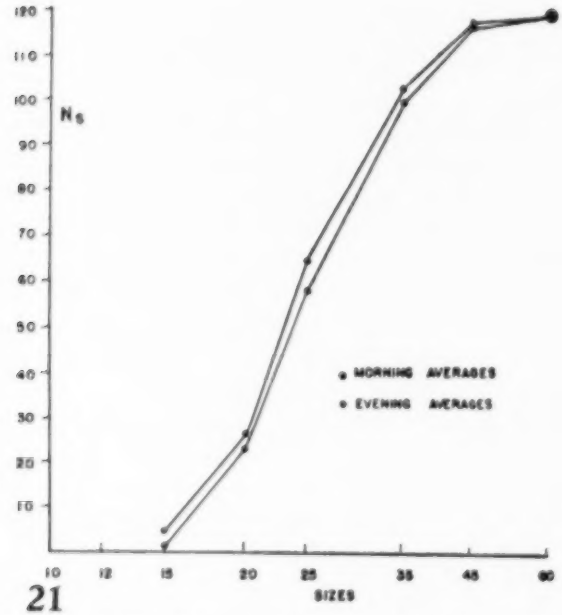
In order to escape the difficulties encountered with the four position chart, one can employ an eight position chart. The data in Figures 14, 15, 17 and 18 can be used to determine what might be expected from an eight position chart. One would expect the same results as those found in Figures 17 and 18, if one used Landolt rings with the breaks in oblique positions and placed the cylinder axes at 90° and 180°; that is, the cylinder axes would simply be moved 45°, and the positions of the breaks 45°. Therefore, the data in Figures 14 and 17 averaged together (Figure 19) and the data in Figures 15 and 18 averaged together (Figure 20) can be regarded as representative of an eight position chart.

In Figures 19 and 20 there should be a gradual decrease in slope from cylinders of zero power to those of higher power, and it should be possible to use the slope of such a curve to detect the presence of astigmatism. The $\bar{S}$ value of such curves should indicate the average ametropia in the two principal meridians. However, the data in Figures 19 and 20 appear to be too variable to permit the use of the slope of the curves as an index of the amount of astigmatism.

In an eight position chart, the form of the curve should be exactly the same when the axis of the astigmatism falls at 45°, 90°, 135°, and 180°. The data do not indicate what would happen if the cylinder axis fell at an intermediate position between any pair of adjacent positions used in the investigation. If it fell at a position exactly intermediate, one would expect that the four positions most remote from it would yield better results than the four positions nearest to it, and again we would be dealing with two levels of performance which might yield a double plateau. However, the tendency towards a double plateau would be much less than in the case of a four position chart with the axis of astigmatism parallel to one of the meridians containing the breaks. One would expect to obtain a curve which in fact is not very different from the results obtained when the cylinder axis falls at 45°, 90°, 135° or 180°.

When using an eight position target, one could analyze the data to determine the position of the cylinder axis precisely, because if the axis coincided with one position of the target exactly, the breaks at

Fig. 19. Data of Subject "A" for an eight position chart. The curves in this figure represent averages of the curves in Figures 14 and 17. Therefore each curve includes data for breaks in eight different positions and with the cylinder axis at 180° or 90°.
Fig. 20. Data for Subject "B." Same significance as Figure 19. The curves in this figure represents averages of the curves in Figures 15 and 18.



21

Fig. 21. The effect of time of day on visual acuity measurements. Average data of two subjects with each wearing a +2.00 D. spherical addition to his distance correction. Data were accumulated during the mornings and afternoons of several consecutive days. The abscissa values represent ring sizes, and each ordinate N_s represents the number of times out of 120 that the position of the break is actually seen. This means that the raw data have been corrected for guessing in accordance with the following equation:

$$N_s = 4/3\ (N_c - 30)$$

where N_c represents the number of times out of 120 exposures that the position of the break is correctly called, whether by guessing or seeing.

right angles to it would be the easiest to detect. And if the axis of astigmatism fell intermediately between two target positions, there would be two positions of the target to yield maximum values of acuity. The axis of astigmatism would be intermediate between these two target positions, or 90° away, according to whether the astigmatism were myopic or hyperopic.

EFFECTS OF FATIGUE

Once or twice these investigations had to be sidetracked to eliminate factors which appeared to be introducing unwanted variations in the data. For instance, the brightness of the target, and its smallness in relation to the rest of the visual field produced a glare condition which appeared to fatigue the subjects. Then, too, the subjects com-

plained of fatigue from the duration of the tests, even though they were permitted frequent rests. This had to be checked for its effect on the data compiled.

The fatigue factor was tested by making duplicate sets of observations under identical conditions between 9 and 10 A. M., and then again between 4 and 6 P. M. on several consecutive days, and on two subjects. Four thousand eight hundred observations were made this way, and the results as shown in Figure 21 suggest that although a subjective awareness of fatigue is experienced at the end of the day, visual efficiency, if anything, tends to improve rather than diminish.

ANNOUNCEMENT

ADVANCE REGISTRATION FOR ACADEMY POST-GRADUATE COURSES.

The 1956 schedule of Post-Graduate Courses, arranged by the American Academy of Optometry, Dr. V. J. Ellerbrock, Chairman, appears in this issue. These Post-Graduate Courses will be given at Houston, Texas, Shamrock-Hilton Hotel, December 5, 6, and 7, 1956. These dates immediately precede the annual meeting of the Academy, December 8, 9, 10 and 11.

These Post-Graduate Courses are open to all optometrists and every practitioner is invited to enroll in those courses of especial interest to him. There are 42 courses covering a wide range of subject material of value to optometrists in clinical practice. Each course will be presented by one or more lecturers selected for their familiarity with the subject and ability to teach. All have had teaching experience.

Optometrists are urged to turn to this Post-Graduate section. After reviewing this material, select the group of courses of particular interest. Advanced registration now assures any optometrist of a complete choice of courses. As the enrollment in *each* of the 42 courses is limited to 30 optometrists (some clinical participation courses are smaller) the time to make sure of a place in each selected class is now.

At this time pick out the courses you wish. Send the list (using course numbers) to Dr. D. G. Hummel,* 418 National City Bank Building, Cleveland, Ohio. This will assure immediate advanced registration. Your check, payable to the Academy, for one-half of the total registration fee must accompany your letter.

A Registration Form is supplied in this issue for convenience in advance registration. The time to act is now, as many will remember that these courses were a "sell-out" at Chicago last year. Pick your courses and mail your registration today. RUDOLPH EHRENBERG

*Chairman, Administration, Academy Post-Graduate Courses.

STATISTICAL ANALYSIS OF HEREDITARY FACTORS IN AMETROPIA*

Richard J. Wixson†
Shamokin, Pennsylvania

The determination of the etiology of refractive errors is of extreme importance in so far as the development of a rational treatment procedure is concerned. This is especially true of the treatment of myopia. The refraction of the eye is determined by the relationship existing between the curvature of the refracting surfaces, indicies of refraction of these surfaces, fluid media of the eye and the anterior-posterior diameter of the ocular system. These are all physical characteristics and they comprise the optical system of the eye. Most authorities agree that changes occur in the physical components of the eye in the period from childhood to maturity. There is less agreement as to how these changes take place. The biological theory states that the refractive error is the result of biological variation and would vary in much the same manner as other physical characteristics such as height. Those dissenting from this view point out that the distribution curve for refractive errors does not conform to the normal probability curve. Another theory which is essentially environmental in character feels that external factors such as near work exert a great influence upon the determination of the refractive error. Opponents of this theory state that different children exposed to the same near work environment often have varying refractive errors. Berens[1] has this to say about the etiology of refractive errors: "Nearsightedness and other errors of refraction may be hereditary and often are familial. For many years close work has been considered an important factor in producing myopia, but in 1941 a study of 150 unselected pairs of twins revealed heredity as the vital factor. Repeated examinations of a series of myopic patients indicated that changes in refraction after age 7 depended on factors which affect growth."

Berens also reports another study of 257 subjects in which (1) neither parent was myopic, 230 of 645 children (35%) had myopia which was purely recessive (2) one or both parents had myopia, 309 of 628 children (49%) had myopia which was dominant.

It is the purpose of this paper to investigate the relationship, if

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†Optometrist, Fellow, American Academy of Optometry.

any, existing between the refractive error of parents and that of their children.

TRANSMISSION OF HEREDITARY TRAITS

A brief account describing the transmission of hereditary traits is relevant to our discussion. It appears that the chromosomes in the germ cells are responsible for the transmission of hereditary characteristics. These are viscous bodies in the nucleus which retain their separate identity in the cell and maintain an absolute constancy in number and shape in each species of plant and animal life. During the processes of growth and development when the somatic cells divide, the chromosomes are split lengthwise so that each daughter cell retains the longitudinal half and the number of chromosomes remains unaltered. However during fertilization when the egg and sperm combine and throughout the nuclear divisions, the chromosomes arrange themselves in pairs, each pair consisting of one of maternal and one of paternal origin. When the germ cells undergo maturation, the number of chromosomes is reduced to half, the egg and sperm receiving one member of each pair. Therefore the egg and sperm have half the number of chromosomes found in the somatic cells and half the germ cells will receive the paternal member of the pair and the other half the maternal. Since each chromosome retains its individuality and shows genetic continuity from generation to generation, the separation of characters depends upon the separation of the chromosome pairs in the reduction divisions and the differences in types and combinations of characters which arise in the offspring are determined by later groupings.[2] It is said that there are 48 chromosomes in man. This leads to wide assortment of characters. Two types are noted: (1) Dominant in which a single gene overshadows any combination in which it may be found and (2) Recessive which requires a double representation to be effective. In addition heredity may be complicated by existence of sex-chromosomes giving origin to what is known as sex-linked hereditary transmission.

EXPERIMENTAL PROCEDURE

For comparison purposes the refractive errors, i.e., the spherical equivalent of the right eye, of parents and their off-spring who had sought eye care were tabulated into the following four categories: father-son, father-daughter, mother-son and mother-daughter. This comprised the hereditary group. A control group of unrelated subjects were formed from two groups of the mothers and fathers of the heredity group and a third group of unrelated subjects were selected at random from the office files. Means, standard deviations of the distributions,

TABLE 1

Giving Ungrouped Data For Hereditary Groups In Diopters

Father-Son		Father-Daughter		Mother-Son		Mother-Daughter	
+3.12	—1.75	+0.75	—0.12	+0.12	—1.75	+3.50	+0.62
—1.75	—0.50	+6.12	+0.75	+1.37	+5.37	+1.75	—2.12
—1.75	—0.87	+1.50	—0.50	+1.12	+2.00	0.00	—0.12
+0.75	—1.12	+0.25	+0.32	—5.00	—2.75	+2.50	+0.75
0.00	—1.25	+0.25	—0.75	—0.25	—1.25	—2.00	—5.00
+0.25	—2.50	+0.50	—4.00	+4.50	0.00	—1.50	—1.25
+2.00	—0.87	+0.50	—2.25	+0.25	+5.87	—5.00	—0.50
+0.50	+0.50	+0.12	—0.12	+2.25	—0.87	+2.00	+0.50
—4.50	—0.75	—0.50	0.00	+1.37	—3.87	—2.75	—2.25
+2.00	—1.62	+0.50	—0.50	+0.37	—4.50	—2.75	—4.00
—0.12	0.00	—0.50	—2.25	+0.50	—2.86	+2.50	+0.62
—1.37	—4.12	+0.87	—1.00	+4.00	+1.25	+2.00	0.00
+1.12	+0.62	+0.87	—1.50	+1.75	—1.62	+2.25	—2.37
+1.12	0.00	+0.12	0.00	0.00	+0.62	—3.50	—2.00
+0.50	+1.37	0.00	+0.12	0.00	0.00	0.00	—1.00
+2.25	+1.00	+0.25	—4.25	+0.75	+0.37	0.00	—1.50
—0.37	0.00	+0.37	—1.12	—1.37	—2.75	—2.25	—1.25
0.00	+2.25	+1.50	+2.25	+1.00	0.00	+1.00	0.00
+0.25	—0.12	—0.12	+0.37	—0.25	+2.25	+0.62	+1.50
+2.87	+0.37	—6.25	—0.87	—6.25	—1.00	+1.00	+0.37
+1.37	—1.50	+0.25	0.00	—2.50	—0.37	+4.00	—1.62
+0.25	—0.82	+0.25	0.00	+3.75	—1.50	+0.50	+1.00
—0.25	—2.75	+0.12	—3.75	+0.37	+0.62	+0.25	+0.37
+0.75	—3.75	+1.75	—1.75	+2.62	+5.37	+1.50	+0.50
—0.37	—3.12	—1.12	+0.12	+1.12	—0.12	+0.12	—0.25
+1.75	+0.25			+1.12	+0.50	+0.12	—1.00
				—0.50	—3.75	—0.12	—4.25
						—0.50	+0.12
						+3.75	+2.25
						+1.25	+2.50
						+1.00	—2.37
						+1.87	+0.62
						+0.50	+0.37
						+0.75	+1.25
						—2.50	—3.25
						+1.75	0.00
						+1.75	0.00
						+0.50	—0.25
						+0.25	+0.12
						+3.50	+3.25
						+1.12	—2.50
						—1.12	—3.75
						+0.62	+0.25

coefficients of correlation and the probable errors of the coefficients of correlation were determined for all categories. Tables 1 and 2.

The hereditary group consists of 101 parents and 122 children. There were about twice as many myopes among the children as there were myopic parents. The ratio of children to parents was 1.2 to 1.0. Essentially this means that parents are more apt to consult an optometrist regarding a child exhibiting poor visual acuity than for another child, say a facultative hyperope, who has relatively good visual acuity.

TABLE 2

Giving Data For Unrelated Groups In Diopters

A		B		C	
+3.12	+0.12	+0.75	+3.50	+0.62	+0.25
—1.75	+1.37	+6.12	+1.75	0.00	+0.25
—1.75	+1.12	+1.50	0.00	+0.25	+0.37
+0.75	—5.00	+0.25	+2.50	+2.75	+0.25
0.00	—0.25	+0.25	—2.00	—0.25	—0.75
+0.25	+4.50	+0.50	—1.50	+0.62	—0.12
+2.00	+0.25	+0.50	—5.00	—0.25	—0.75
+0.50	+2.25	+0.12	+2.00	0.00	+0.25
—4.50	+1.37	—0.50	—2.75	—0.25	+2.62
+2.00	+0.37	+0.50	—2.75	+0.25	+2.00
—0.12	+0.50	—0.50	+2.50	0.00	+0.87
—1.37	+4.00	+0.87	+2.00	+0.50	—5.12
+1.12	+1.75	+0.87	+2.25	—0.75	—0.37
+1.12	0.00	+0.12	—3.50	+1.00	—1.50
+0.50	0.00	0.00	0.00	+0.25	+1.12
+2.25	+0.75	+0.25	0.00	+2.25	—0.12
—0.37	—1.37	+0.37	—2.25	+1.75	+0.25
0.00	+1.00	+1.50	+1.00	—1.50	+0.12
+0.25	—0.25	—0.12	+0.62	—0.37	—0.37
+2.87	—6.25	—6.25	+1.00	+3.12	+0.25
+1.37	—2.50	+0.25	+4.00	+0.25	+1.50
+0.25	+3.75	+0.25	+0.50	+1.75	+1.75
—0.25	+0.37	+0.12	+0.25	+0.75	+0.12
+0.75	+2.62	+1.75	+1.50	+2.50	+0.87
—0.37	+1.12	—1.12	+0.12	+0.12	—1.00
+1.75	+1.12			+0.75	+0.25
				—5.25	—0.12
				+1.25	0.00
				0.00	+1.50
				+0.25	—0.25
				+0.75	—4.00
				+0.25	—0.37
				—1.00	—5.75
				—1.12	0.00
				+0.62	+4.50
				—5.50	+3.00
				—3.87	+0.62
				+1.12	+1.75
				+0.37	+0.87
				+0.25	+0.37

It is important, therefore, that we understand that the sample under investigation is representative only of those parents and children who have sought eye care and might not be representative of a sample containing all the members of a series of families. Many of the parents consulted the author because of presbyopia while their children did so because of the symptoms of myopia.

The control group of 182 subjects were sub-divided into three categories ("A," "B," "C") consisting respectively of 25, 26 and 40 (paired) persons. Results are given in Table III.

TABLE 3

Giving N, Means, Standard Deviations, Coefficients of Correlations (r) and Probable Errors of r

	Father-Son		Father-Daughter		Mother-Son		Mother-Daughter	
N	26	26	25	25	27	27	43	43
Mean	+0.40	—0.80	+0.33	—0.83	+0.45	—0.18	+0.47	—0.62
S. D.	1.57	1.52	1.85	1.35	2.21	2.26	1.95	1.78
r	+0.16		+0.15		+0.25		+0.45	
$P.E._r$	0.12		0.11		0.11		0.08	

Control Group	A		B		C	
N	25		26		40	
Mean	+0.33	+0.23	+0.40	+0.45	+0.10	+0.13
S. D.	1.85	2.23	1.56	2.21	1.72	181
r	+0.07		—0.36		—0.09	
$P.E._r$	0.13		0.10		0.10	

DISCUSSION OF RESULTS

On the basis of the sample submitted the spherical equivalent refractive error frequently differs between parents and their children. This is shown by the means. While it is realized that the means are affected by extreme scores nevertheless an analysis of the data reveals almost twice as many myopic children as there were myopic parents computed on a percentage basis. Range of scores for the parents were from +6.12 D., to —6.50 D. For the children +5.87 D., to —5.00 D.

The percentage of scores falling between ±1 sigma in the related groups (with the exception of the father-daughter category) averaged 68.6%. Including above group brought average up to 71.5%. Therefore there appears to be some similarity between this and a normal distribution although less symmetrical samples may possess this characteristic.

The coefficient of correlation r must be evaluated from several aspects. One classification[3] as to the significance of r is as follows:

r from 0.00 to ±0.20 denotes indifferent relationship.
r from ±0.20 to ±0.40 — low correlation.
r from ±0.40 to ±0.70 — marked relationship.
From ±0.70 to ±1.00 — high to perfect correlation.

This classification is tentative and should be evaluated with regard to (1) nature of material dealt with (2) PE_R (3) size and variability of group and (4) the purpose for which r was computed. In regard to material an r of 0.30 between height and intelligence if significant i.e., more than four times PE. would be regarded as marked, rather than low, since experience has shown that correlations between physical and mental functions are lower around zero. With respect to physical and

mental traits of parents and off-spring resemblence is commonly expressed by r's from 0.35 to 0.55. In comparing the r's of our related and unrelated groups we find for the related groups that all are positive and vary in the same direction.

In the unrelated group two of the correlations are negative, i.e., spherical equivalent refractive errors varied in opposite directions. All of the correlations of the related group are higher on the positive side than any of the correlations of the unrelated group. In regard to actual magnitude only the mother-daughter of +0.45 has real significance. This undoubtedly approaches correlations of other physical traits found between parents and offspring.

SUMMARY AND CONCLUSIONS

(1) There appears to be a greater positive correlation between the total refraction, as measured by the spherical equivalent, of parents and their children then between unrelated individuals.

(2) The highest positive correlations were found between mother-daughter and mother-son respectfully. Statistically, only one of the correlations, that between mothers and daughters, can be said to be significant, i.e., expresses a relationship which is greater than chance.

(3) Extreme caution must be used in interpreting the results since it is possible for individuals having the same total refraction to possess different optical physical characteristics.

(4) For this sample it appears that the refractive error had more of the characteristics of a recessive than of a dominant hereditary trait.

8 WEST SUNBURY ST.,
SHAMOKIN, PENNSYLVANIA.

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OPTIQUE PHYSIOLOGIQUE. Tome Troisieme L'Espace Visuel, by Yves Le Grand, Professeur au Museum National d'Historie Naturelle. Examinateur des Eleves a l'Ecole Polytechnique. Preface de Jean Becquerel, membre de l'Institut. Published by the "Revue D'Optique," 165, rue de Sevres, 3 et 5, boulevard Pasteur, Paris (XVe) France. 391 pages. Illustrated. Board covers. 1956.

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A LOCAL VISUAL-CARE PROGRAM

In the upper midwest an effective promotional job is being done to arouse interest in visual care. A group of optical laboratories have joined in an extensive advertising campaign to drive home the slogan, "You Can't Replace Your Eyes — A Yearly Examination Is Wise."

These laboratories are members of the Upper Midwest Council for Better Vision. The Council developed a fine promotional program and its members invested a sum of $18,000 all of which is being spent in newspaper advertising throughout the area. Every other week 45 daily papers are used including all the large metropolitan papers of the area. The campaign is planned to run throughout the year. Every daily newspaper in the area is included in this campaign.

The ads, which are illustrated by small pen and ink drawings, occupy a six inch, double column space and stress the need for a periodic

eye examination by an optometrist or ophthalmologist. The copy is changed with each insertion. The only signature is that of the Upper Midwest Council for Better Vision.

Here is a local program of visual-care public relations which has an adequate budget, and which thoroughly covers the area with week to week continuity. The program has been in effect long enough to demonstrate its effectiveness and is meeting good response from both the public and the interested professions.

Nine laboratories contribute funds to make the campaign possible. These are Bausch & Lomb, Benson, Maves, Minnesota, Nelson, Soderberg, Twin City, Twin Ports and Walman optical companies. As these laboratories vary in size, their pro-rata cost of the program also varies, but this has been worked out to a point where it is equitable for both the large and small laboratory. The Nelson-Willis Advertising Agency of Minneapolis is handling the account for the Upper Midwest Council for Better Vision.

This program of public relations is so successful that it is already being copied and considerable additional interest is shown by laboratories serving other areas, who are considering similar local visual-care campaigns.

It may be, that this type of plan is the solution to the need for a strong program of local visual-care public relations, just as the BETTER VISION INSTITUTE is the answer at the national level.

The advantages are, that a small group directs the program and thus can come to some agreement as to what shall be done. The funds are raised and there is no overhead, as an advertising agency handles the account on commissions received from the purchase of space from the newspapers, and all collected funds are productively employed. In addition—and this is a big advantage—all optometrists, ophthalmologists and opticians who do business with these laboratories are indirectly contributing to the welfare of the campaign, as the total funds collected for the activity are determined by the volume of work done by the laboratories. This plan eliminates, to a very great extent, those whose natural inclination is to "ride-free."

Many of our State Optometric Associations have good public relations plans, but here the funds must come from only interested members. Non-members contribute nothing, yet they, too, benefit, and, as the numbers of non-members nearly equal those who are members, the State Association plans place a heavy burden upon members particularly in those states where the total number of optometrists is small.

The visual-care program now under way by the Upper Midwest Council for Better Vision is an outstanding one, and may prove to be the pace maker for similar campaigns in many parts of the country.

CAREL C. KOCH

THE ACADEMY MEETING IN HOUSTON AND A TRIP TO MEXICO

The "packaged tour"—the pre-paid trip which relieves the traveler of uncertainties of hotel reservations, what to see, how to get to see it, when and where to eat—is increasing in popularity. Understandably so, since such a pre-arranged travel plan saves mental fatigue as well as time and money.

Academy members and their wives who are going to Houston can enjoy just such a care-free, seven-day jaunt into Mexico following the convention—departing December 12th. Should some members and guests prefer to make the trip prior to the convention opening date, December 5th, the Harvey Travel Bureau of that city suggests that you arrange your departure from Houston on November 26th which permits you to enjoy Thanksgiving at home and yet return to Houston in ample time for the convention. Either date you choose allows time for the extra side-trip to the famous Acapulco seashore resort if desired. Since transportation costs to Houston are deductable, and the Mexico "packaged tour" is economical, the idea is worthy of your consideration.

From the moment the Pan-American plane door slams and the engines "rev up" at Houston's airport, you start relaxing. After just 3½ hours of "above weather" flying, your representative welcomes you at Mexico City's magnificent new airport. From that moment, Romero, David or Jose—whoever your guide may be—takes over. He has learned your language for your convenience; he is bonded by his government; he is fiercely proud of his job as "official host." You won't waste time looking for him during your stay. Before you catch sight of him any morning, he has already seen you. He knows also that you have been in the barber shop, had poached eggs for breakfast, sent a wire, left a suit to be dry-cleaned and that you have an eye for a pretty senorita. Don't be mistaken about his naive manner. He is probably a college graduate. His simple reply, "Si, Senor" is sincere but not servile.

To say that you have "seen Mexico" after visiting one of her border cities is to say that one has seen the United States after spending a few hours in International Falls or any other of our northern border towns. Mexico's culture and history lie far south of the border. Amid

the glitter and gayety of Mexico's night life, rush of traffic, glamour of her modern hotels, apartments, pent houses or clubs, we forget that her culture dates back some 2,000 years. Beneath the expanse of concrete of the Zocalo (the central square in front of the National Palace and the Cathedral) lies twenty feet of foundation made from the rubble of pagan temples torn down for the greater glory of God. No one knows the masterpieces of Aztec art that lie beneath. The National Palace stands upon the Halls of Montezuma. While driving up the broad, landscaped Avenida Reforma, enroute to Chapultepec Castle (once the home of the ill-fated Carlotta and Maximilian), you trace the line of march of many victorious armies.

On your third day, floating through the Xochimilco gardens in a flower-decked boat, you follow the commercial highways of the early Aztec farmers. Today, their descendents use them to bring their vegetables to market. Though the sale of trifling trinkets and souvenirs is their livelihood, shop-keepers feel no resentment if you do not buy. Mexicans resent only rudeness or ridicule. Children who coax for coins won't waste them on toys. Your pennies go for food for the ever-hungry little ones at home.

Your "packaged tour" for optometrists includes no meals in Mexico for good reason. This permits freedom for exploration. You can be sure of good meals at any first-class hotel you choose. To lunch on the patio of the cafe called "1-2-3-" is pleasant. Jena (pronounced Hay-na) and a cafe called Quid (Queed) offer extensive menus for lunch or dinner. Try Bellinghausen for German dishes. The Normandie is a favorite of gourments. (Expensive.) "Dinner hour" in Mexico means 9 P. M. Any cafe will serve you earlier but you may be the only customer there.

Menus of all leading hotels and cafes are continental in scope. European chefs reign in kitchens. In fact, to order ordinary Spanish or Mexican food in some swank restaurants will lift your waiter's eyebrows. Daily planes bring choice sea-foods from Mexico's sea-coasts, wild game from her mountains or lakes and choice delicacies from all ports of the world.

A word about one's health while in Mexico. Upon arrival, the average visitor is apt to over-do things a bit—take in too much food, stimulants and sight-seeing and too little rest. Mexico City is approximately 9,000 feet up. One high-ball does the job of two at home. Rum is preferable. Digestion seems to lag a bit. Experienced visitors eat lightly. Order mountain water to your room for drinking and teeth brushing. It is advisable to avoid uncooked vegetables, lettuce

and milk. Your druggist or doctor will suggest a mild iodine pill commonly carried by international travelers. They are harmless and a good preventative.

Clothing you will need in Houston will serve well. Dress is informal except at special private parties. In such cases, dinner clothes are in order. Nights are chilly enough for small furs. Ladies will find but few hats worn. Over-night laundry service is available. As our guide once said, when asked about need for an extra wrap, "Si, Senora. In Mayhico you sneeze once, that's 'Salude'! You sneeze again, we say, 'Salude'! But you sneeze three times, Senora, that's 'pneumonia'!"

As you stand outside of your hotel, the business men and girls you see on the street are likely to be pure Aztec Indian. Many who have typical Spanish surnames are also. The explanation is simple. During the Spanish conquest, the Crown and the Church aimed to convert the pagan Indians to a colonial status and a Catholic faith. There were mass baptisms for children. Perhaps three hundred infants would be given the same Spanish surname simultaneously, which accounts for the many Gomez's, Gonzales's and Martinez's in the phone book. A Spanish name does not denote a Spanish lineage.

Bright-eyed bell boys working in hotels attend school while they work. Many are University students. If time permits, visit their famous "University City" which has but recently risen from lava rock. The fabulous, artistically designed stadium attests to Mexico's interest in athletics. To glimpse the near-by contemporary homes in the recently developed "Pedregal Section" is an eye-opener.

Your tour would not be complete without a glimpse of prehistoric Mexico to be seen in the pyramids—the ancient altars of the Toltec and Aztec tribes, built to honor the god of learning, Quetzalcoatl. (Ladies should wear comfortable, flat-heeled shoes. You will find good camera material here.)

However humble its appearance and surroundings, the Shrine of Guadalupe is significent. The little "dark Madonna" is the most revered and cherished patron saint in Mexico. (Ladies, as an act of respect and courtesy, wear a head covering in all Mexican churches. A scarf or just a handkerchief suffices.)

Another highlight of your trip is your visit to the historical cities of Taxco and Cuernevaca which lie down Southwest of Mexico City. December is an especially good time since tourists are fewer and fiestas are plentiful. Your motor trip to Taxco takes you through historic, scenic country-side. Roads are good and you may feel assured of your driver. In most cases, the car you ride in is his place of business. Auto-

mobiles are costly in Mexico. He doesn't intend to lose his business through carelessness.

Taxco, the "town of silversmiths," is but one of several Mexican "monumental" villages being preserved for posterity. Owners of historic buildings in Taxco—business or residential—cannot so much as change or add a window to their real estate without governmental approval. The original architectural style must not be violated. In certain such monumental villages, neon signs are not allowed. In Taxco there is more leniency.

In this region, several centuries ago, a man named Borda who was searching for gold, found silver instead. So Taxco became a silver mining center and silversmithing was its leading craft. A few mines are still in operation. Carved above the door of the majestic old cathedral facing the square are the words—"What God gives to Borda, Borda gives to God." In appreciation of the discovery which gave him immense riches, he built this and other churches for the devout peons of the village.

After your unforgetable ride over the cobblestone streets to your hotel (to describe that experience would be most unfair!), you will stroll back down to find Taxco a gay, fascinating village. Mexicans love music and color, so, along with business, they have both. As you wander the ancient, crouded streets, prowl the countless shops in search of some momento, music blares from radios, songs fall from the lips of these fun-loving people to whom work is a pleasure and a privilege. Above the carnival din, church bells peal out the hour of mass, parrots scream in their cages and birds sing in the tree-tops. Come the nightfall, dogs bark their reply to the donkeys braying on the hillside. " 'Tis well to sleep long the night before you come to Taxco!"

You may enjoy pleasant bartering with small shop owners who sell inexpensive baskets, articles of tin, jewelry et cetera. But in the larger, finer stores facing the square, business is business. There you find the work of top craftsmen. Silver is priced by weight. Look for the identifying mark that assures you of its purity. The proprietor will explain it if you ask him.

Before evening activity starts up the hill at your hotel—the Rancho Telva (named for the famous opera star and designed by the equally famous Bill Spratling), you should have time for a leisurely "tall one" at "Bertha's." This little cantina near the cathedral is world famous.

Returning North the next morning, your arrival at Cuernevaca brings you a village of Toltec origin which once was the leading

"summer resort" of the nineteenth century. Your stop at the Borda Gardens will show you that summer residences of the conquistadores were no mere week-end shacks. Note the elaborate watering system that freshened the extensive gardens; observe the stadium seats built on either side of what once was the swimming pool. To escape summer weather of Mexico City and to have change of altitude, many Mexicans continue to maintain summer homes in Cuernevaca. The city boasts of pent-houses, golf courses as well as the magnificent homes hidden behind exquisite wrought-iron fences and vine-covered, ancient, masonry walls. The temperate climate and reasonable living attract States people to live here. Anne Lindbergh spent part of her childhood in Cuernevaca during the time her father, Dwight Morrow, was United States ambassador to Mexico; Virginia Safford, well known columnist, has recently joined the States colony of home owners. The village is rapidly losing her "old world" atmosphere and appearance. Now linked to Mexico City by a new super-highway, she has become a suburb of the capital city.

Optometrists who can spare the extra three days for the short flight to Acapulco will see modern Mexico at play. If ocean bathing is your preference, choose a hotel near the village at the water's edge; if scenery and a pool has greater appeal, select one of the many fine hotels located high on the brow of the cliff. Inquire about the sun-down yacht trip, or join a group who are going out for some deep sea fishing. A packaged "night tour" will lead you into gay spots. Your Houston agent can arrange such extra details.

To get the most from your trip, contact the Harvey Travel Bureau early—now, in fact.* This allows plenty of time to exchange correspondence and plan every detail. It is to your advantage to do so.

Hasta la Vista! Happy Landings, Amigos!

HARRIET PEPIN†

*Write to Mr. D. Stuart Godwin, Jr., Harvey Travel Bureau, 2005 W. Gray Ave., Houston, Texas, official Travel Bureau for the pre- and post-convention Mexican tours for Academy members and their wives and guests. The dates of the annual meeting of the Academy, Shamrock Hilton Hotel, Houston, Texas, are, December 5-11, 1956.

†Minneapolitan author and world traveler. Especially written for the AMERICAN JOURNAL OF OPTOMETRY AND ARCHIVES OF AMERICAN ACADEMY OF OPTOMETRY, June 15, 1956.

AMERICAN ACADEMY OF OPTOMETRY

POST-GRADUATE COURSES

Shamrock-Hilton Hotel
Houston, Texas
December 5, 6, 7
1956

V. J. Ellerbrock, Chairman
Committee on Instruction
D. G. Hummel, Chairman
Committee on Administration

GENERAL INFORMATION ON POST-GRADUATE COURSES

Time: All courses are scheduled for the three days immediately preceding the regular annual meeting of the Academy.

Place: All of the courses will be taught in the Shamrock-Hilton Hotel unless otherwise designated.

Applicants: Any optometrist may apply for one or more courses.

Cancellation: In case of cancellation by applicant the fee will be returned, providing such cancellation is received no later than November 17, 1956.

Cost: The cost per hour of instruction is $2.00 unless otherwise specified.

Enrollment: For most of the courses the enrollment is limited to 30. Several very specialized courses, however, are limited to twelve participants.

Number of Courses: Forty-two (42).

Hours of Instruction: One hundred and eight (108).

Applications: All applications should be sent to Dr. D. G. Hummel, 418 The National City Bank Bldg., Cleveland, Ohio.

Deposit: One-half the total fee for each course must accompany the application. The balance must be paid at the commencement of the courses. The courses designated with an asterisk (*) are limited in enrollment. Applications for these courses must be accompanied by the *full* fee.

Tickets: Without exception, everyone enrolled in a course must register and pick up the appropriate ticket. Without it, no one can be admitted.

Lecture Rooms: These will be posted at the registration desk. The hotel bulletin board will state the location of the registration desk. Please check your time schedule of courses. The Committee cannot be responsible for conflicts of scheduling.

KEY TO DESIGNATION OF PERIODS

Time	Wednesday	Thursday	Friday
8:00 A.M.	W-8	T-8	F-8
9:00	W-9	T-9	F-9
10:00	W-10	T-10	F-10
11:00	W-11	T-11	F-11
12:00	W-12	T-12	F-12
1:00 P.M.	W-1	T-1	F-1
2:00	W-2	T-2	F-2
3:00	W-3	T-3	F-3
4:00	W-4	T-4	F-4
5:00	W-5	T-5	F-5
8:00	W-E	T-E	F-E

Course 1
Elements of Graphic Anaylsis
Charles Abel, O.D.
Los Angeles, California
Gordon Heath, O.D.
Bloomington, Indiana
A four-hour course—$8.00
Periods: W-4, W-5, T-4, T-5

An introduction to the principles of graphic analysis, with emphasis on the plotting of optometric data on the analytical graph, the detection of faulty findings, and the understanding of the basis of case analysis and prescription.

Course 2
Raubitscheck Test for Astigmatism
Merrill J. Allen, O.D., Ph.D.
Bloomington, Indiana
A two-hour course—$4.00
Periods: W-2, W-3

Tests for astigmatism such as the fan dial, rotating "T" and the Jackson cross cylinder will be reviewed. In comparison, the Raubitscheck Test will be described and its advantages discussed. There will be a demonstration of the Raubitscheck test principles.

Course 3
Subjective Testing Procedures
Merrill J. Allen, O.D., Ph.D.
Bloomington, Indiana
A two-hour course—$4.00
Periods: T-8, T-9

A study of subjective procedures used in an eye examination, and some of the more frequent sources of error and causes of test failure will be reviewed. The following tests will be covered: visual acuity, duochrome, maximum plus for maximum acuity, near point, astigmatism tests and the effects of distance test criteria on near test findings.

Course 4
Recent Advances in Visual Science
Mathew Alpern, O.D., Ph.D.
Ann Arbor, Michigan
A two-hour course—$4.00
Periods: T-2, T-3

A review of theoretical and experimental results of recent publications in the field of visual science and physiological optics will be presented. Emphasis will be placed on those works which seem most likely to have a lasting effect upon future thinking and clinical practice. These will include work in visual physiology, movements of the eyes and their relation to the visual act, accommodation, convergence, pupil size, and visual psychophysics. Work which especially points out deficiencies in our current, theoretical positions will be discussed and wherever possible the direction of revision of theory will be indicated.

Course 5
Phorias: — Physiological Considerations and Practical Applications
Mathew Alpern, O.D., Ph.D.
Ann Arbor, Michigan
A two-hour course—$4.00
Periods: F-8, F-9

Course will be devoted to a study of the behavioral and physiological factors which influence the magnitude of the phoria measurement. Recent studies of the basic characteristics of the phoria position will be reviewed and the applica-

tion of such information to clinical practice will be emphasized. A comparative analysis of various phorometry techniques will be made and the problems and pitfalls in applying phoria data to arrive at the prescription will be pointed out. Emphasis will be on horizontal phoria measurements but a brief discussion of the problems of vertical phorias will be presented also.

Course 6
Amblyopia, Suppression and Related Phenomena

Neal J. Bailey, O.D., Ph.D.
Bloomington, Indiana

A two-hour course—$4.00

Periods: F-8, F-9

A central problem in the diagnosis and prognosis of cases presenting anomalies of binocular integration is the existence of suppression. The relationship of suppression to amblyopia and other anomalies will be discussed from the point of view of etiology and from this the principles of treatment of such cases will be developed.

Course 7
Aniseikonia and Space Eikonometry

Robert E. Bannon, O.D.
Southbridge, Massachusetts
Paul L. Connolly, O.D.
Royal Oak, Michigan
Benton C. Freeman, O.D.
Allentown, Pennsylvania
Leo F. Madigan, O.D.
Boston, Massachusetts
Oscar L. McCulloch, O.D.
Holyoke, Massachusetts

A six-hour course—$12.00

Periods: W-E, T-E, F-E

Part I—*Introduction to Aniseikonia and Space Perception.*
The historical aspects of aniseikonia, etiological factors and the development of instrumentation for its measurement will be reviewed. Principles of monocular and binocular space perception and the influence of image-size differences upon stereoscopic spatial localization will be discussed and demonstrated.

Part II—*Space Eikonometry*
Detailed instruction in the technique of measuring aniseikonia with the space eikonometer will be supplemented by a consideration of the more common clinical problems encountered in the use of the space eikonometer. The theoretical basis of space eikonometry and the significance of the measurements will be reviewed. However, major emphasis will be given to practical aspects.

Part III—*Clinical Aspects of Aniseikonia.*
The interpretation of the space eikonometer findings and clinical judgment in prescribing will be augmented by a discussion of approximations for changing spectacle lens magnifications with typical examples. A panel of experienced aniseikonic clinicians will present patients' case records, discuss their individual practices, and answer pertinent questions.

Course 8
Presbyopic Corrections—Physiological Basis

Robert E. Bannon, O.D.
Southbridge, Massachusetts

A one-hour course—$2.00

Period: W-1

This course will review the various ocular factors and how they may be measured in routine clinical practice. Consideration will be given to the determination of near point prescriptions based upon these data and the patient's individual needs.

Course 9
Management of Difficult Refractive Problems

Robert E. Bannon, O.D.
Southbridge, Massachusetts

A one-hour course—$2.00

Period: T-1

Unrelieved symptoms and unsatisfactory refractive findings may be considered as "difficult refractive problems." Symptoms and history will be discussed from the standpoint of visual, ocular, and referred disturbances. A review of auxiliary investigations will include comparison of astigmatic chart versus cross-cylinder findings, binocular refractive techniques, cyclodamia and cycloplegia, accommodative astigmatism, monocular occlusion and binocular anomalies.

Course 10
Design of Eikonic Lenses

Edwin W. Bechtold, O.D.
New York, New York

A three-hour course—$6.00

Periods: T-12, F-4, F-5

Translation of eikonometer findings into a final prescription and design of correction lenses will be developed at length. The procedure for designing single and bi-toric lenses also will be outlined. Special emphasis will be given designs of lenses that can be fabricated by local laboratories.

Course 11
Optical Aids for Subnormal Vision

Edwin W. Bechtold, O.D.
New York, New York

A three-hour course—$6.00

Periods: W-8, W-9, F-10

A discussion of the optical principles of sub-

normal vision aids. The course will deal with the optics of telescopic spectacles, microscopic spectacles, strong plus additions, and projection magnifiers. Theoretical limits for the performance of these devices will be discussed.

Course 12
Vision Screening of School Children
Lois B. Bing, O.D.
Cleveland, Ohio
A three-hour course—$6.00
Periods: W-12, T-12, F-12

School children's vision and need for screening. Problems involved in screening. Screening programs in operation today. Instrumentation available. Statistics on screening programs. A larger view of the purpose of the screening program.

Course 13
Streak Retinoscopy
J. C. Copeland, O.D.
Chicago, Illinois
A four-hour course—$8.00
Periods: W-10, W-11, T-10, T-11

A presentation of the fundamental principles behind the use of the streak retinoscope. Each student will be provided with all necessary equipment including a retinoscope, schematic eye, transformer and lenses. The course is conducted to give each man personal supervision and instruction as well as lectures for the group. The course will be given on two separate days, each session lasting two hours.

Course 14
Design in Eyewear
Margaret S. Dowaliby, O.D.
Los Angeles, California
A two-hour course—$4.00
Periods: T-1, F-1

Design of modern eyewear as related to patient's facial features, coloring, etc. Particular attention will be given to the role of eyewear in the feminine wardrobe; wherever possible actual demonstrations will be provided.

Course 15
Turville Infinity Balance Test
Jay M. Enoch, O.D., Ph.D.
Columbus, Ohio
A two-hour course—$4.00
Periods: F-10, F-11

Methods and interpretation of monocular refraction under binocular conditions with special emphasis on anisometropia, suppression, lateral and vertical prism, and aniseikonia screening.

Course 16*
Visual Rehabilitation of the Partially Blind
William Feinbloom, O.D., Ph.D.
New York, New York
Irving P. Filderman, O.D.
Memphis, Tennessee
A three-hour course—$12.00
Periods: W-4, W-5, T-4
Enrollment limited to 15

This course will present the role of the optometrist today in the field of rehabilitation. The history, purpose, and present organization of the blind and partially blind agencies in this work will be reviewed.

It now has been amply demonstrated that it is desirable for optometrists to be associated with these agencies. The *modus operandi* for such cooperation will be explained.

The sociological, psychological, and educational problems involved with various optical aids also will be presented.

Course 17
A Minimum Strabismus Examination
Merton C. Flom, O.D.
Berkeley, California
A two-hour course—$4.00
Periods: W-4, W-5

The essential components of a minimum strabismus examination are a short history and four series of tests: Confrontation test, objective cover test, diplopia test and Worth dot test. These will be discussed and demonstrated. Case studies also will be presented to show the practical application of the tests.

Course 18
Color Vision Testing
Glenn A. Fry, O.D., Ph.D.
Columbus, Ohio
A one-hour course—$2.00
Period: F-11

The course will deal with the techniques employed in the diagnosis of color vision deficiencies. Descriptions will be given of instruments, charts and other devices used in the diagnosis and some of these will be demonstrated. The application of these tests in motorists vision screening, railroad and aviation examinations and in specific industrial situations will be described.

Course 19
Analysis of Problems with Retinoscopy
Glenn A. Fry, O.D., Ph.D.
Columbus, Ohio
A one-hour course—$2.00
Period: F-2

The following subjects are covered in this course: Methods of combating reflections from lens surfaces; interpretation of scissor motion and unusual types of reflexes; interpretation of discrepancies between subjective and retinoscopic findings.

Course 20
Measurement of Central Scotoma
Ernest J. Giglio, O.D.
Bernardsville, New Jersey
A one-hour course—$2.00
Period: T-5

Techniques for the measurement of central scotoma in pathologic and non-pathologic cases. Brief resume of anatomical and physiological basis for the measurement including cognizance of the accuracy of central fixation in the normal individual.

Course 21*
Advanced Course in Contact Lenses
Robert Graham, O.D.
Pasadena, California
William Feinbloom, O.D., Ph.D.
New York, New York
John Neill, O.D.
Philadelphia, Pennsylvania
William Policoff, O.D.
Wilkes-Barre, Pennsylvania
An eight-hour course—$32.00
Periods: T-10, T-11, T-2, T-3, F-10, F-11, F-2, F-3
Enrollment limited to 12

Techniques for maximum success in the fitting of contact lenses. The course includes a thorough exposition of the methods for securing optimum results in regular cases, as well as procedures employed in handling the more complicated and difficult problems. The course is for those who already have substantial experience in the fitting of contact lenses.

Course 22
Light and Lighting for the Optometrist
Sylvester K. Guth, E.E., D.O.S.
Cleveland, Ohio
A two-hour course—$4.00
Period: F-E

The course will cover: (a) Relationships between light and sight; (b) Light and color; (c) Lighting practice; (d) The role of the optometrist.

Course 23
Multifocal Lenses for Anisometropic Patients
Monroe J. Hirsch, O.D., Ph.D.
Ojai, California
A one-hour course—$2.00
Period: W-12

Near vision tasks for anisometropic patients fitted with spectacles involves a number of problems connected with the unequal prismatic effect of the lenses. Different approaches exist to the solution of these problems by purely optical means, but they cannot be discussed without reference to the individual patient's history and symptoms. This course is designed to study each of these aspects and to help the practitioner to attain a balance appropriate to the needs of the individual patient.

Course 24
Review of Ocular Pathology
Organized by the Section on Pathology, American Academy of Optometry.
Monroe J. Hirsch, Chairman
A six-hour course—$12.00
Periods: W-E, T-E, F-E

Course 25
Optometric Economics
H. W. Hofstetter, O.D., Ph.D.
Bloomington, Indiana
A one-hour course—$2.00
Period: F-1

A review of the factors affecting the financial status of optometrists and the development of individual practices.

Course 26
Advanced Graphic Analysis
Henry W. Hofstetter, O.D., Ph.D.
Bloomington, Indiana
A two-hour course—$4.00
Periods: F-4, F-5

A study of selected cases to determine a prescription for lenses and/or prisms and/or orthoptics. Prerequisites: The ability to plot accommodation and convergence findings on the conventional graph with reasonable facility.

Course 27
Fundus Photography
Fred W. Jobe,
Rochester, New York
A two-hour course—$4.00
Periods: F-2, F-3

Fundus photography provides a quick and accurate method of recording the ocular manifestations of a disease. Within the last several years a number of major advances have been made in this field. These will be reviewed. In addition the requirements for this type of photography will be discussed. Particular emphasis will be given to the use of infra-red radiation which eliminates the need for mydriasis.

Course 28
Ocular Pharmacology
Donald E. Kroeger, Ph.D.
Houston, Texas
A two-hour course—$4.00
Periods: W-2, W-3

An introduction will be given to the pharma-

codynamic action of various drugs on the internal muscles of the eye. This will be followed by a discussion of such other aspects of the problem as methods of introducing the drugs, dosage, etc.

Course 29
Administration of Vision Programs in Industry
Arnold L. Langsen, O.D.
Wood-Ridge, New Jersey
A two-hour course—$4.00
Periods: T-8, T-9

This course is designed primarily to give practical information to the optometrist in the initiation and administration of an efficient vision program in Industry. It is not within the scope of this course to discuss the need for such a program, or the selling of such a program to management—certainly, a plethora of material has been written about this phase, and is generally available to those interested. This course will be more in the nature of how-to-do-it. Both in-plant and out-plant operations will be discussed. It will cover the following topics:

I. The Place of the Plant Optometrist in the Table of Organization.
II. How to Set Vision Standards for All Occupations.
III. Screening Administration.
IV. Modifying the Rx. for Occupations.
V. Record Keeping and the Optometrist As an Expert Witness.
VI. Special Duties—Illumination and Magnifying Devices.
VII. Out-Plant Operation of a Vision Program.

Course 30
Neurosis in Optometric Practice
John L. McCary, Ph.D.
Houston, Texas
A two-hour course—$4.00
Period: W-E

It is estimated that one out of three persons is neurotic. Since this condition has to be met and coped with in optometric practice, it is necessary that the optometrist understand it. The elements of a neurosis will be described and frequent references made to the expected manifestations in the routine care of patients.

Course 31*
Introduction to Slit Lamp Microscopy
Bernard Mazow, O.D.
Houston, Texas
A three-hour course—$12.00
Periods: W-1, T-4, T-5
Enrollment limited to 12

Lectures and demonstrations in the mechanics of using the bio-microscope, methods of observation, etc. The participants will practice using the instrument on each other under supervision of the instructor. If time permits, common pathological conditions will be discussed.

Course 32
The Role of Surgery in the Treatment of Squint
Meredith W. Morgan, O.D., Ph.D.
Berkeley, California
A two-hour course—$4.00
Period: T-E

This course will deal with the critera to be followed in the decision of referring a strabismus patient for surgery. These involve the questions of timing for surgery, precision of a surgical correction of squint, pre- and post-operative orthoptics, and interprofessional relationship with the surgeon.

Course 33
Simple Objective Testing Procedures for Motility
Meredith W. Morgan, Jr., O.D., Ph.D.
Berkeley, California
A one-hour course—$2.00
Period: W-1

A great deal of information can be obtained with a simple flashlight. This course will feature a lecture and demonstration of the use of the flashlight in the investigation of various motor and sensory functions of the eye, such as pupil, convergence, version, fixation, fusion and other processes.

Course 34
Strabismus Testing and Diagnosis
T. R. Murroughs, O.D.
Santa Barbara, California
A three-hour course—$6.00
Periods: T-8, T-9, F-12

A consideration of basic specific tests to evaluate the type of strabismus in terms of the patient's responses. Differential diagnosis established on basis of responses.

Course 35*
Beginning Contact Lens Fitting
John Neill, O.D.
Philadelphia, Pa.
and Associates
An eight-hour course—$32.00
Periods: W-10, W-11, W-2, W-3, T-10, T-11, T-2, T-3
Enrollment limited to 12

For this course, the assumption is made that the practitioner has no prior experience with contact lenses. A comprehensive study will be made therefore of the principles, design and fitting of modern contact lenses. A considerable part of the course will be devoted to practical instruction of fitting, insertion and removal.

Course 36
The Recognition of Early Pathology
Jack H. Prince, F.B.O.A.
Columbus, Ohio
A two-hour course—$4.00
Periods: W-10, W-11

Colored photographic illustrations will be used as a basis for demonstrating the earliest ocular manifestations of both ocular and systemic disease.

Course 37
Home Training for Orthopics
Max Schapero, O.D.
Los Angeles, California
A two-hour course—$4.00
Periods: W-8, W-9

A description of the home training techniques available for implementing office training both for strabismic and non-strabismis problems. The importance, advantages, and disadvantages of home training techniques will also be discussed.

Course 38
Fitting of A Ptosis Crutch
Paul F. Shulman, O.D.
Chicago, Illinois
A one-hour course—$2.00
Period: F-3

The characteristic symptoms and problems of the ptosis patient will be discussed. Different means of fitting will be described for individual differences. A complete step by step procedure for doing a ptosis fitting will be outlined.

Course 39*
Glaucoma and Tonometry
Harold Simmerman, O.D.
Wenonah, New Jersey
Monroe J. Hirsch, O.D., Ph.D.
Ojai, California
A four-hour course—$16.00
Periods: F-8, F-9, F-4, F-5
Enrollment limited to 12

The incidence of glaucoma especially in the aged makes it necessary that every optometrist fully understand this complicated visual disorder. To meet this need a specific course on the disorder was organized. It includes the etiology, diagnosis, prognosis and treatment. Special consideration is given to the optometric approach of this disease.

This course also is designed to acquaint the practitioner with the two principal methods of measuring intraocular pressure. Each member of the class will have the opportunity of obtaining experience with both methods.

Course 40
Visual Fields and Perimetry
Harold Simmerman, O.D.
Wenonah, New Jersey
Monroe J. Hirsch, O.D., Ph.D.
Ojai, California
A three-hour course—$6.00
Periods: W-12, T-12, F-12

This course will be divided into two parts: one, a presentation of the basic techniques of visual field plotting, and two, the analysis, interpretation and clinical significance of the findings. Special emphasis will be given to the expected changes in the visual field due to incipient glaucoma.

Course 41
Practice Management
Ralph E. Wick, O.D.
Rapid City, South Dakota
Carel C. Koch, O.D.
Minneapolis, Minnesota
A two-hour course—$4.00
Periods: W-8, W-9

1. The Growing Practice
2. The Mature Practice
3. Discussion on techniques of practice management

Course 42
Fixation Disparity as a Diagnostic Method
Daniel Woolf, O.D., Ph.D.
A two-hour course—$4.00
Periods: T-1, F-1

A basic course in the clinical measurement of fixation disparity at near in a refractor; the basis and technique of the test, and interpretation of results with patient discomfort in mind. Actual demonstrations for each participant will be provided.

CONDENSED SCHEDULE OF COURSES

Course	Instructor	Subject	Hours	Periods
1	Abel & Heath	Elements of Graphic Anaylsis	4	W-4, W-5, T-4, T-5
2	Allen	Raubitscheck Test for Astigmatism	2	W-2, W-3
3	Allen	Subjective Testing Procedures	2	T-8, T-9
4	Alpern	Recent Advances in Visual Science	2	T-2, T-3
5	Alpern	Phorias:—Physiological Considerations and Practical Applications	2	F-8, F-9

6	Bailey	Amblyopia, Suppression and Related Phenomena	2	F-8, F-9
7	Bannon, Connolly, Freeman, Madigan & McCulloch	Aniseikonia and Space Eikonometry	6	W-E, T-E, F-E
8	Bannon	Presbyopic Corrections—Physiological Basis	1	W-1
9	Bannon	Management of Difficult Refractive Problems	1	T-1
10	Bechtold	Design of Eikonic Lenses	3	T-12, F-4, F-5
11	Bechtold	Optical Aids for Subnormal Vision	3	W-8, W-9, F-10
12	Bing	Vision Screening for School Children	3	W-12, T-12, F-12
13	Copeland	Streak Retinoscopy	4	W-10, W-11, T-10, T-11
14	Dowaliby	Design in Eyewear	2	T-1, F-1
15	Enoch	Turville Infinity Balance Test	2	F-10, F-11
16*	Feinbloom & Filderman	Visual Rehabilitation of the Partially Blind	3	W-4, W-5, T-4
17	Flom	A Minimum Strabismus Examination	2	W-4, W-5
18	Fry	Color Vision Testing	1	F-11
19	Fry	Analysis of Problems with Retinoscopy	1	F-2
20	Giglio	Measurement of Central Scotoma	1	T-5
21*	Graham, Feinbloom, Neill & Policoff	Advanced Course in Contact Lenses	8	T-10, T-11, T-2, T-3, F-10, F-11, F-2, F-3
22	Guth	Light and Lighting for the Optometrist	2	F-E
23	Hirsch	Multifocal Lenses for Anisometropic Patients	1	W-12
24	Section on Pathology, AAO	Review of Ocular Pathology	6	W-E, T-E, F-E
25	Hofstetter	Optometric Economics	1	F-1
26	Hofstetter	Advanced Graphic Analysis	2	F-4, F-5
27	Jobe	Fundus Photography	2	F-2, F-3
28	Kroeger	Ocular Pharmacology	2	W-2, W-3
29	Langsen	Administration of Vision Programs in Industry	2	T-8, T-9
30	McCary	Neurosis in Optometric Practice	2	W-E
31*	Mazow	Introduction to Slit Lamp Microscopy	3	W-1, T-4, T-5
32	Morgan	The Role of Surgery in the Treatment of Squint	2	T-E
33	Morgan	Simple Objective Testing Procedures for Motility	1	W-1
34	Murroughs	Strabismus Testing and Diagnosis	3	T-8, T-9, F-12
35*	Neill & Associates	Beginning Contact Lens Fitting	8	W-10, W-11, W-2, W-3, T-10, T-11, T-2, T-3
36	Prince	The Recognition of Early Pathology	2	W-10, W-11
37	Schapero	Home Training for Orthoptics	2	W-8, W-9
38	Shulman	Fitting a Ptosis Crutch	1	F-3
39*	Simmerman & Hirsch	Glaucoma and Tonometry	4	F-8, F-9, F-4, F-5
40	Simmerman & Hirsch	Visual Fields and Perimetry	3	W-12, T-12, F-12

41	Wick & Koch	Practice Management	2	W-8, W-9
42	Woolf	Fixation Disparity as a Diagnostic Method	2	T-1, F-1

*In each Course the enrollment is generally limited to thirty. In Courses marked with an asterisk (*) the enrollment is limited to a smaller number because of the clinical or instrumental character of the course.

AMERICAN ACADEMY OF OPTOMETRY

Post-Graduate Courses

Applications should be made to Dr. D. G. Hummel, 418 The National City Bank Building, Cleveland 14, Ohio. One-half of the total fee must accompany the application. The balance must be paid at the commencement of the courses. Without exception, everyone enrolled in the courses must register and pick up appropriate tickets for each course. Without them, no one can be admitted. Acceptance of applications will be on a first come first served basis. When the number allowable in any course is filled, applications will be received on a contingent basis and used in case of cancellation. In case of cancellation the fee will be returned, providing such cancellation is received no later than November 17, 1956.

Advance Order Sheet

Please check the courses you wish to take.

No. of Course	Instructor	Hours	Total Fee	Date	Time

Name _____

Address _____

City _____ State _____

For Use of the Committee on Administration

Deposit _____ Balance _____

Date Received _____

Notified _____ Date _____ Accepted _____ Contingent _____

CUT HERE AND MAIL

SCHEDULE OF COURSES BY HOUR

Hour	Wednesday (W)			Thursday (T)			Friday (F)		
8:00 A.M.	37	11	41	29	34	3	6	5	39
9:00 A.M.	37	11	41	29	34	3	6	5	39
10:00 A.M.	36	35	13	21	35	13	21	11	15
11:00 A.M.	36	35	13	21	35	13	21	18	15
12:00 noon	12	23	40	12	10	40	12	34	40
1:00 P.M.	8	31	33	9	42	14	25	42	14
2:00 P.M.	2	35	28	21	35	4	21	19	27
3:00 P.M.	2	35	28	21	35	4	21	38	27
4:00 P.M.	1	17	16	1	31	16	26	10	39
5:00 P.M.	1	17	16	1	31	20	26	10	39
8:00 P.M.	30	7	24	32	7	24	22	7	24

Note: In program of Courses, (E) denotes 8:00 P.M. Evening Course.

CURRENT COMMENTS

Terry Judith Parkins
Editorial Assistant

Optometrists will confer a favor by sending news items of general interest for this department; such as relate to new instruments, clinical techniques, education, visual health and optometric legislation and organization.

IMPAIRING THE FUTURE OF OPTOMETRY

We are always pleased to consider that optometrists are privileged to serve the public in one of the finest health professions that exists. We are pleased, too, to consider that our profession developed to promote the fullest possible visual service for the benefit of all. Optometrists today do an excellent job of examining, refracting and prescribing for the visual defects of their patients.

But we are disturbed, as we scan the current professional picture, to observe some events and trends that seem destined to impair the ability of our profession to function in the long-range best interests of optometrists.

We think, for instance, that much that is now happening will restrict, rather than enhance, the ability of optometrists to further develop the ever-raising standards of optometric care. And, perhaps, we think that optometrists themselves are to blame for these conditions.

What seems to us most fundamentally wrong, as we survey the optometric scene, is first that there is an over emphasis on ocular pathology. We ourselves may be at fault in this, in our positive and commendable efforts to uncover diseased conditions as these effect the eye. However, we feel that too much is made of the few cases of ocular pathology that do show up. Actually there is very little eye pathology that anyone does anything constructive about. Particularly

as one considers the relatively small number of pathological cases which exist within large blocks of the population.

Another aspect of optometric activity that seems fundamentally wrong is the growing tendency to regulate the details of optometric practice. For instance, at least one optometric law now specifies the minimum number of diagnostic and refractive tests which must be made by optometrists in the course of each ocular examination and refraction. We are quite aware of the reasons for this legislation but we believe there must be a better way of correcting the improprieties of practice among a very small minority of optometrists, than to saddle such regulations upon all optometrists.

In the same vein, we find the growing tendency to legislate optometrists into the lecture rooms. Here we criticise the idea that adult professionals can be made to learn, by forcing them to sit through post-graduate lectures they do not wish to hear, just to assure themselves that their certificates of registration will be renewed each year. Post-graduate work should be made so attractive that optometrists will want to attend. If this is not true, then it is time wasted all around.

Another aspect of organizational life that seems fundamentally wrong is the growing tendency among State Optometric Associations of forcing their membership to contribute to many special projects, or even in some cases to take out memberships in other non-affiliated organizations, as a requirement for membership in the State Association itself. To clutter up State Association membership requirements with a number of added financial responsibilities, in the end serves to raise the dues to a point of diminishing returns. Our State Optometric Associations should consist of the large majority of the optometrists of each state. The fact that this frequently is not true, is because those in control have lost sight of the real objectives of these associations, and have permitted them to be burdened with a host of extraneous projects that had best been left to function independent of the association. Our State Optometric Associations are essential to the future of Optometry, as these are the agencies that must look after our political and economic welfare. Projects not directly connected with the work at hand should be excluded from their programs and from their dues requirements.

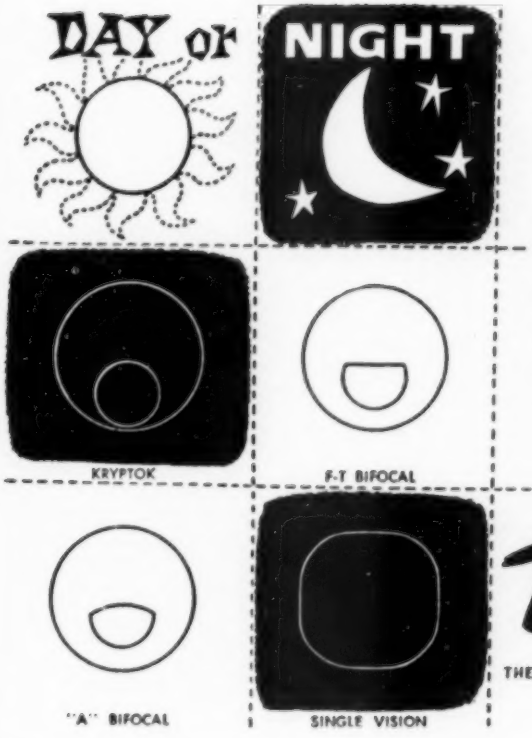
The path of progress for all optometrists lies in sticking closely to Optometry. In doing the very best examining and refracting job possible. In holding restrictive rules and regulations to a minimum and keeping our State Optometric Associations democratic by welcoming large membership at dues levels all can afford.

FLOWER HEADS AMERICAN OPTOMETRIC ASSOCIATION

At Miami Beach, Dr. Rupert E. Flower, Visalia, California, took over the presidency of the American Optometric Association. He follows Dr. Norman B. Hays, Niagara Falls, New York. The other officers are, Dr. Lester H. Sugarman, Meridian, Connecticut, president elect; Dr. Hoyt S. Purvis, Jonesboro, Arkansas, first vice-president; Dr. P. N. DeVere, Morganton, North Carolina, second vice-president; Dr. Joseph M. Babcock, Portsmouth, Ohio, third vice-president; Dr. H. Ward Ewalt, Pittsburgh, treasurer; Dr. Ernest H. Kiekenapp, Minneapolis, secretary. The 1956 A.O.A. Congress was a well run convention and the attendance was fair. The delegates were united on all matters before the House, and Washington, D. C., was selected as the 1958 convention city in a good natured four-way fight for this honor in which Philadelphia, Minneapolis and St. Louis took part. The 1957 A.O.A. annual congress will be held in Los Angeles. A large hall in the convention hotel was filled with commercial exhibits and optometrists from all parts of the country inspected the displays of materials and instruments. The Miami congress was the 59th annual meeting of the A.O.A.

NEWS BRIEFS

Joseph F. Taylor, 67, Rochester, New York, chairman of the board, Bausch & Lomb, died June 13. . . . William G. Rabe, New York City, was elected chairman of the board, Shuron Optical Company, at their annual meeting. Donald F. Southgate was re-elected president of the company. . . . The OPTOMETRIC WEEKLY has announced that optometrists may examine their third *Optometric Annual* on a ten-day trial basis. This 1956 volume sells for $4. Orders should be sent to the Weekly, 5 N. Wabash Ave., Chicago 2. . . . The New York Academy of Optometry honored Dr. E. LeRoy Ryer, New York City, for 50 years of outstanding service to his profession, at its June meeting. . . . The American Optometric Association reports that 38 million Americans who need visual care are not getting it. . . . Dr. Henry W. Hofstetter, director, Division of Optometry, Indiana University, Bloomington, Indiana, again heads the Association of Schools and Colleges of Optometry. The association had its annual meeting in Miami Beach.



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in our CHICAGO and NEW YORK CITY offices

In order to supplement our work in the field we have set up a special schedule. The three-day courses are so laid out that the practitioner will have a better understanding of the fitting of contact lenses. The course will cover the fitting of all types of lenses with emphasis on the most successful types of contact lenses. Clinic and practical work will be stressed in every instance. Every member of the class will have a pair of lenses made for him.

The cost of the course is $65.00 which will include the cost of personal prescription lenses. Telescopic contact lens fitting, cosmetic contact lens fitting and other types of specialized fitting will be stressed.

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June 25-26-27	June 28-29-30
August 20-21-22	August 23-24-25
TIME:	TIME
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2:00 pm to 5:00 pm	2:00 pm to 5:00 pm

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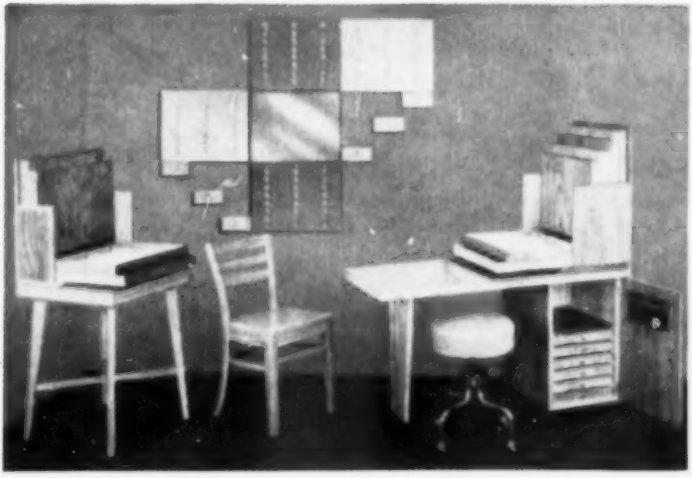

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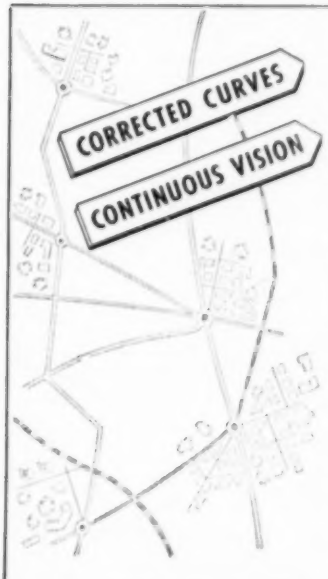

Where do the roads of ophthalmic progress lead?

Scientific progress shows the right roads ahead more clearly with each passing year. This has been particularly true in the ophthalmic field. Those laboratories which have used only the quality products of the progressive manufacturer have found that they benefit and build both themselves and the doctors whom they serve.

This has certainly been true in the case of corrected curve lenses. Progressive laboratories everywhere stress their use—and they mean even more to the doctor and his patients. We lend our voice strongly to this suggestion. It is our firm belief that we serve better by supporting such recommendations.

We also add our voice to those of the increasing numbers who are advising the prescription of Continuous Vision Lenses in the practice of eye care. Produced on the excellent Univis Series of Corrected Curves, CVs represent the ultimate in performance for a substantial percentage of presbyopic prescriptions.

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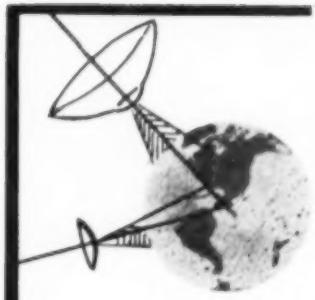

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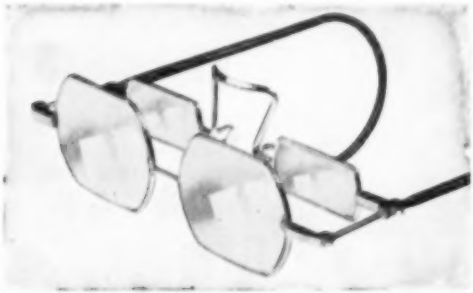
Scleral lenses Assymetrical lenses Micro lenses

New B Micro lenses



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It is indicated for most patients who still have reading difficulties even after full correction.

The Rx model has an additional frame in which the wearer's own reading prescription can be inserted. In the Standard model, simply remove the ocular lenses (smaller one) and substitute lenses containing Rx added to power of the ocular lenses. In either case the reading prescription thus becomes an integral part of the optical system of the loupe.

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POST CONVENTION TOUR TO MEXICO CITY — December 12th

(To follow Academy meeting in Houston)

The Harvey Travel Bureau has been appointed as the official tour operator for the post-convention tour to Mexico in December.

Those coming from the North and East may not realize that Mexico City is only three and a half hours from Houston and that this would be a golden opportunity to visit South of the Border. Since the trip from the home city to Houston would be deductible, the additional transportation cost to Mexico City would be a minor expense.

A seven-day tour, including a City Tour, Xochimilco, Pyramids, Shrine of Guadalupe, Taxco, and Cuernavaca, has been set up. For those who can spend a few days longer, there is a three-day extension to Acapulco.

For full particulars, write:— **HARVEY TRAVEL BUREAU**

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